TECHNOLOGY DEPT.

PUBLIC LIBRARY
MAY 9 - 1941
DETROIT

CHARLES A BRESKIN, Publisher
WILLIAM T. CRUSE, Editor
DR. GORDON M. KLINE, Technical Editor
HARRIET B. JOSEPHS, Managing Editor
HELEN SHALET, Associate Editor
DONALD R. RUTHER, Art Director

modern plastics

JUNE

The young ladies above are being supported by the plastic interlayer in a sheet of safety glass which had previously been subjected to a severe pressure and breakage test. This represents one of the latest developments which will be fully described in a feature article on the Evolution of Safety Glass. Originally scheduled for this month, this article was held over to make room for news of the opening of America's Modern Plastics Exposition (see page 35) and the announcement of the Sixth Annual Modern Plastics Competition appearing on page 51.

MAY 1941

VOLUME 18 NUMBER 9

• GENERAL INTEREST

Plastics go to the people 35
Growth of plastics 50
Announcing Sixth Annual Modern Plastics Competition 51
Complete plastic contact lens 54
Darkroom light filters 60
Medical demonstration torso 61
London letter 108

• TECHNICAL SECTION

Soybeans in plastics 69
Plasticity of molding compounds 72
Plastics at St. Louis A. C. S. meeting 75
Improved design for injection mold 77
Plastics digest 78
U. S. plastics patents 80
Foreign plastics patents 86

• NEWS AND FEATURES

Product development 56
Plastics in review 62
Stock molds 68
Publications 88
Machinery and equipment 90
In the limelight 94

E. R. GORDON, Production
R. G. GERMAISE, Circulation

BUSINESS STAFF: ALAN S. COLE, General Manager
P. H. BACKSTROM, J. M. CONNORS, L. B. CHAPPELL
M. A. OLSEN, R. L. DAVIDSON, W. S. ROSS, Promotion

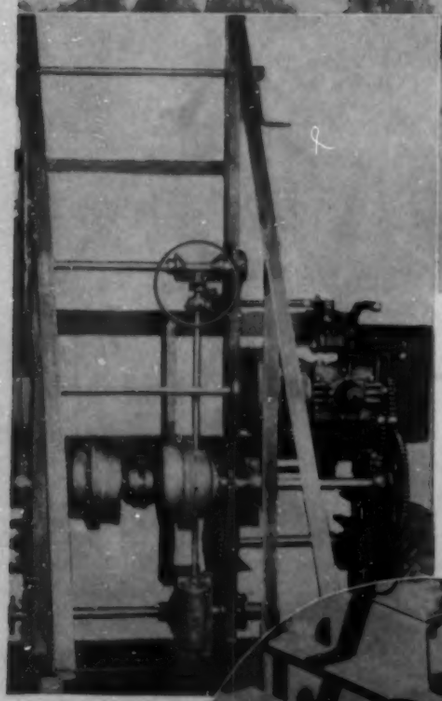
Published the 5th of each month by Breskin Publishing Corporation. Publication office, Twentieth and Northampton Sts., Easton, Pa. Executive and Editorial Offices, 122 E. 42nd St. (Chanin Bldg.), New York, N. Y. Phone ASh1and 4-0655. Mid-Western office, 221 N. LaSalle St., Room 1338, Chicago, Ill. Phone Randolph 6336. Pacific Coast Office, 427 West 5th St., Los Angeles, Cal. Cleveland, Ohio, Office, 1010 Euclid Ave.; telephone Prospect 2020. Also Publishers of Modern Plastics Catalog, Modern Packaging, Packaging Catalog. Subscription price $5.00 per year, $8.00 for 2 years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year, $9.00 for 2 years, all other countries, $6.00 per year, $10.00 for 2 years, payable in American money or its equivalent. Price 50¢ per copy, except October issue, which is $2.00. Copyright 1941 by Breskin Publishing Corp. All rights reserved. Printed in U. S. A. Entered as second class matter May 28, 1940, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Back numbers (except October) 3 months or more preceding current issue, when available, $1.00 each. Modern Plastics is fully protected by copyright and nothing that appears in it may be reprinted, either wholly or in part, without special permission.

Member of Controlled CCA Circulation Audit

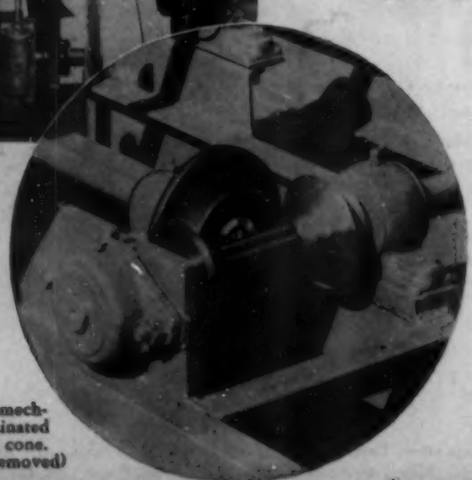
ADVERTISING PAGES REMOVED

INSUROK AT WORK

on conveying equipment



Chassis view of Fairfield Smoothflo Conveyor



Close-up of driving mechanism showing Laminated INSUROK friction cone. (all weather covers removed)

LAMINATED INSUROK

The conveying equipment manufactured by The Fairfield Engineering Company of Marion, Ohio, is subjected to constant punishment and rough usage. For that reason great care is given to the selection of structural materials. Significant, therefore, is the choice of Laminated INSUROK for the driven friction cone that moves laterally between two machined steel driving cones. Through the INSUROK cone, power is transmitted to the winding shaft which carries the drums for the hoisting cable.

For difficult jobs, Laminated INSUROK gears, friction drives, bearings, and other mechanical parts daily prove their inherent ability to withstand the destructive action of wear, weather and corrosion; to give extra years of trouble-free, dependable service.

Consult Richardson engineers about the use of this tough, durable, long-wearing plastic. Laminated INSUROK, in your product or in manufacturing processes, will cut operating costs and improve performance.

The RICHARDSON COMPANY

Melrose Park, (Chicago) Ill. Founded 1858 Lockland, (Cincinnati) Ohio
New Brunswick, N. J. Indianapolis, Ind.
Detroit Office: 4-252 G. M. Building, Phone Madison 9388
New York Office: 75 West Street, Phone Whitehall 4-4487

MODERN PLASTICS
WILLIAM T. CRUSE, Editor

MAY 1941 VOLUME 18 NUMBER 9

Plastics go to the people

DRAMATICALLY translating polysyllabic laboratory lingo into a thrilling show of products and progress, America's Modern Plastics Exposition is on its way direct to the public! With its theme "A Dawn of a New World in fashion, color, product, durability and beauty," it is a brilliantly conceived, spectacular cavalcade of plastics. This tremendous, complete educational symposium brings to confused consumers for the first time, through America's leading retail stores, a vivid, accurate picture of plastics—not in text-book terminology, not as static museum pieces, but in a theatre-like fair of every-day familiar objects. To the consumer who today picks up a telephone, rings a door bell, struggles with a bottle cap, brushes his teeth, combs his hair and uses a fountain pen—or who uses plastics in a thousand different ways without knowing it—America's Modern Plastics Exposition brings an informative, unbiased answer to the question, "What are Plastics?"

No longer a precocious prodigy swaddled in test-tubes, the plastics industry has grown up industrially. Unfortunately, a forbidding aura of mysterious chemical formulas and erroneous misconceptions surrounding plastics has kept at arm's length the retailer and his customer alike. Just when the epochal development corner was turned is neither definitely known nor vital, but the recent flood of Munchausen tales about invisible airplanes, collapsible automobiles, radios poured into forms like jello in six delicious colors, have blotted the

An amazing group of over 40 three-dimensional, 8 ft. by 4 ft. high displays, are the focal point of America's Modern Plastics Exposition. A wide variety of domestic, business and industrial uses for plastics are included as shown in the cases pictured in these pages

record of achievement. With every advance in chemical cross-breeding, the confusion has increased. There has been, nevertheless, a growing consciousness of the utility and beauty of these products. Actually with sound research, intelligent application, through specialized and mass production, plastics have taken a solid position in the front line along with other essential raw materials. They are firmly entrenched. The groundwork is securely prepared for their continued advance. To bring plastics closer to the final consumer, to explain their construction, their methods of manufacture, to outline the various types and their respective value in different kinds of products, and their suitability—this traveling show has been assembled. A panorama of progress, it concentrates the history of their evolution for ready review. It depicts the results of years of accomplished research and looks into the future with imagination tempered by knowledge.

Completed after two years of planning, assembled after thousands of hours of patient, skillful work in designing, detail, dramatization and construction, the Exposition has been produced and supervised by W. L. Stensgaard and Associates, Incorporated, in cooperation with MODERN PLASTICS magazine. The idea of an all-inclusive plastics show of such magnitude was conceived as a result of a series of meetings between W. L. Stensgaard and Charles A. Breskin, publisher of MODERN PLASTICS. With a brilliant record of design and display experience, Mr. Stensgaard was eminently qualified to execute and develop an exhibit of such

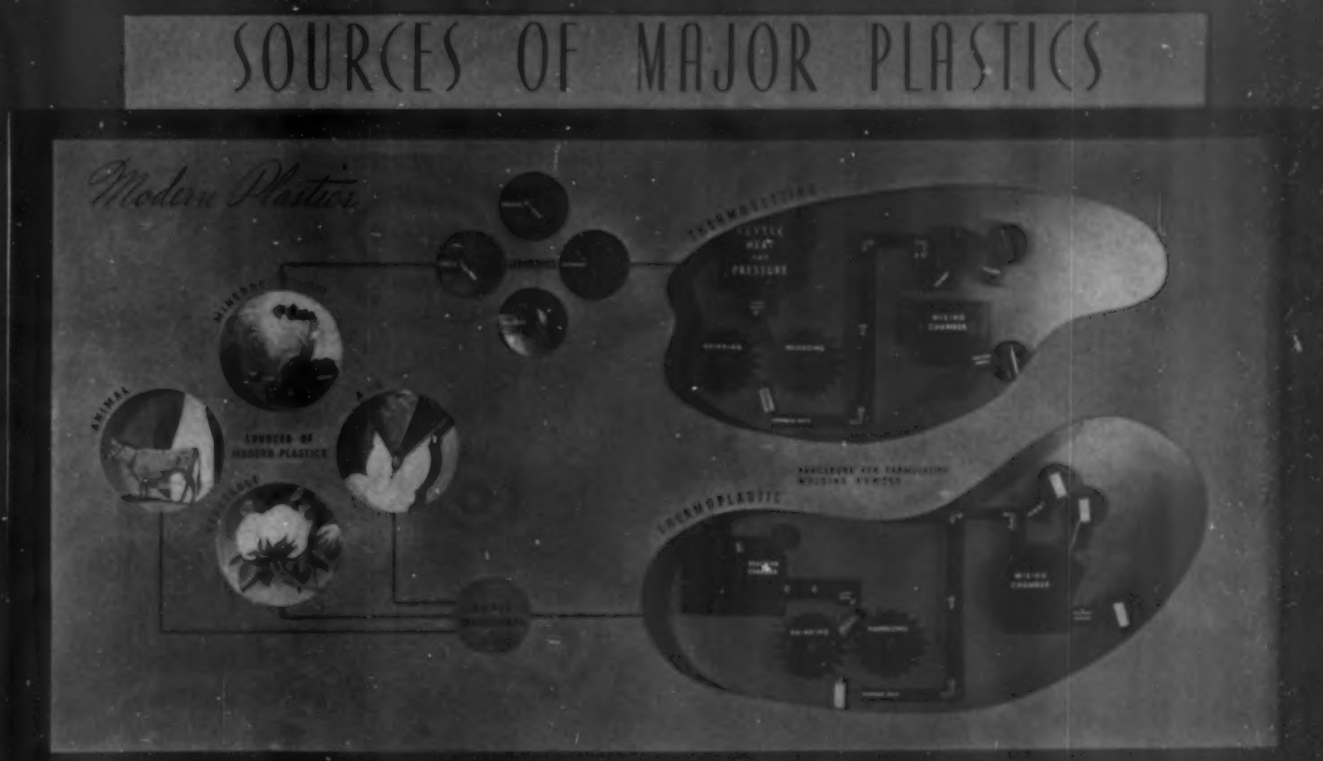
tremendous proportions. Once preliminary sketches were outlined, the original conception was amplified into a major enterprise realized through creative inventiveness and practical vision. Mutual collaboration between Mr. Stensgaard and Mr. Breskin, augmented by participation of active factors in the plastics industry, has evolved an Exposition unprecedented in scope and excellence for consumer exhibits in this country.

America's Modern Plastics Exposition made its debut April 21st, at Elder and Johnston's department store in Dayton, Ohio, in connection with their 58th Anniversary Celebration. Elaborate plans were made for a highly educational program of activities within the store and in clubs, schools and theatres throughout the week. The company sent out 86,000 tabloid size newspapers which prominently featured the announcement of the Exposition, along with other direct mail, newspaper and radio publicity. A complete report of this first stop in the parade of America's Modern Plastics Exposition from coast to coast will appear in our June number.

From Dayton other expositions are scheduled to travel to millions of consumers and retailers during 1941 in department stores throughout the nation. The current itinerary will appear in the June issue and will be augmented from time to time. Providing a week chock full of activity, special attractions that will draw store-wide traffic, the Exposition is of tremendous interest to the retailer from the point of unlimited publicity opportunities locally and in neighboring territory. Definitely associated with merchandising, promotion and institutional interest, this educational "World's Fair of Plastics" is designed to enlighten and inform Mr. and Mrs. America about plastics. It has a strong appeal to the technician, student, store employee and executive, industrialist and buyer.

What is this Plastics Exposition?

A gigantic show designed for department store presentation, it will combine every feature of interior and exterior department store display with local activities—



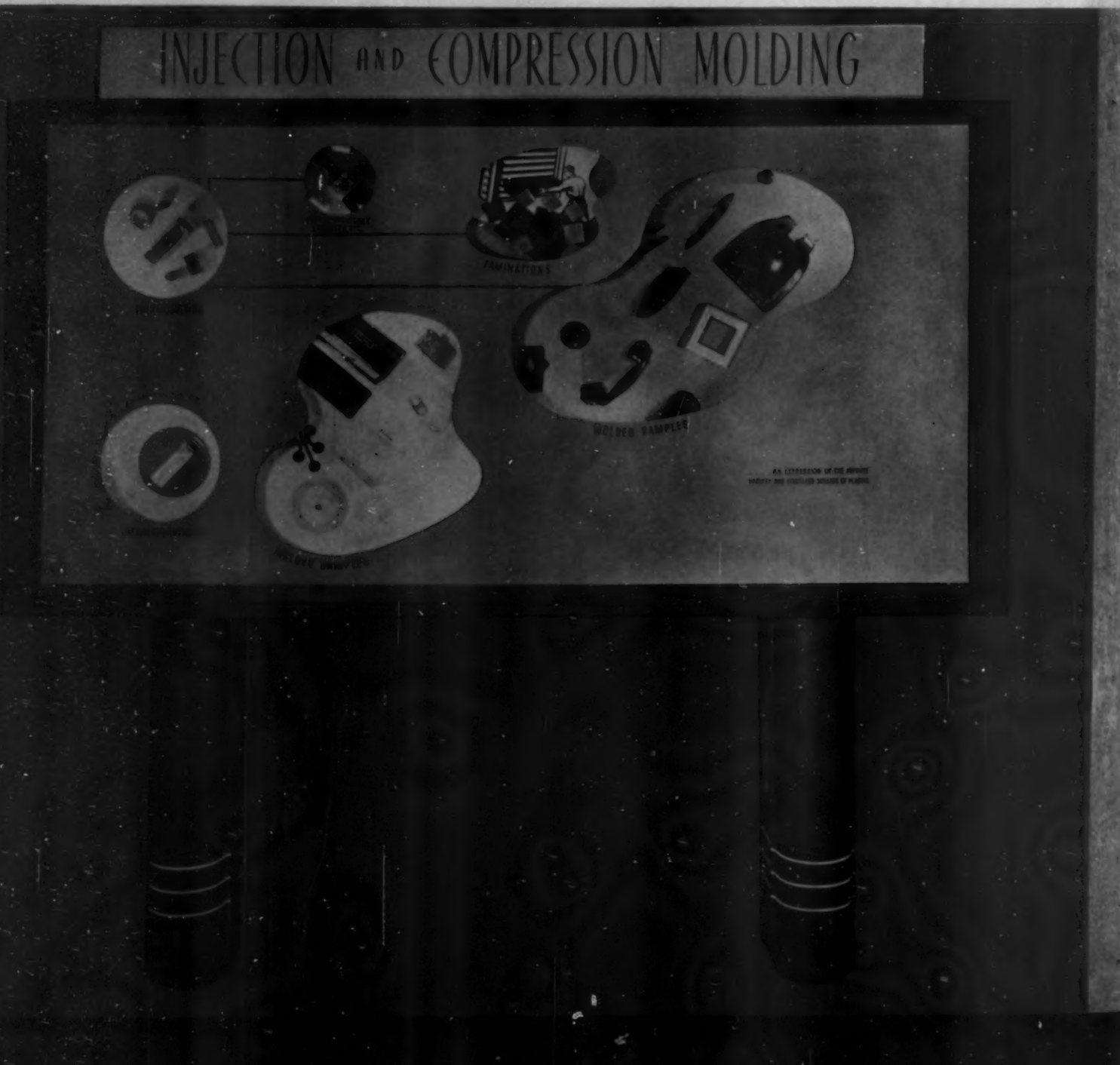
radio, schools, universities, local theatres, newspaper advertising, etc. Feature attractions include an exclusive, effective dramatized exhibit of the Award Winners in the 1940 Modern Plastics Competition in specially built elevated shadow boxes. Day and night window displays, colorful store decorations, departmental exhibits of plastics in merchandise of today, a laboratory press molding demonstration, a plastic mannequin, a sound and color movie and a prize essay contest to be sponsored by the store, make every day an event. Under the guidance of experienced executives, personnel are trained to operate motion pictures and plastic molding machines, deliver lectures and contact the public. Vigorous, attention-catching posters and news releases are provided to engage the public interest. These tie up such current factors as national defense, statements by prominent industrialists, designers, scientists, historical data, contest prizes, packaging terminology and every type of industry.

Every hour of the day is accounted for by some interesting activity, some form of entertainment to meet every age and interest. Every available opportunity for tie-ups throughout the store and community is considered in this imaginative exhibit. The focal point is a series of striking sectional dramatized exhibits.

Shadow box displays

Functional in design and flexible to conform to any requirement of store facilities, each section is 4 ft. high overall by 8 ft. long and 17 in. deep. Illuminated for most dramatic effect, the exhibits are placed at eye level, easy to look at, easy to study. Quality finishes and materials and excellent coloring arrangements blend for a harmonious smartly designed setting. The legs on which each unit is placed are removable, as are the ends and side. Individual or double units can be set up. Double sections which can be set up at right angles, fold together when legs and side are detached, thus becoming their own shipping containers.

Approximately 40 in all, different exhibit cases have been made which may be arranged altogether in an



auditorium or large slow traffic department, or split up into separate units which may be placed at strategic points throughout the store. Modern backgrounds, unique lighting effects are designed to spot-light the attractive colors and finish inherent in the galaxy of practical plastic articles for use in diversified fields. For the most part the separate items are grouped functionally according to the type of application or the industry in which it is utilized. An exclusive presentation of award winners and honorable mentions from the Fifth Annual Modern Plastics Competition of 1940, fill the majority of the cases. Miscellaneous items—molded, laminated, cast and extruded—collected with the aid and cooperation of the plastics industry—amplify the display. Other units are purely educational, graphically depicting at a glance the story of plastics—sources of major plastics, raw materials, related products, methods of molding, and phases of plastics production. Some of the main divisions follow:

Machinery and Appliances
Radio and Communications
Aviation and Transport
Lighting
Packaging
Architecture
Decorations
Photographic and Musical
Home Furnishings and Housewares
Plastics in homes and buildings of the future
Sporting Goods, Games and Toys
Novelty and Miscellaneous
Business and Office Equipment
The plastic family and relatives
Sources of major plastics
Injection and compression molding
Cosmetics and Decoration

(*Please turn to next page*)

MACHINERY AND APPLIANCES
LIGHTING
PLASTIC IN HOMES AND BUILDINGS OF THE FUTURE

Other concentrated feature displays of additional items of merchandise of unusual character but with ready sale provide direct merchandise opportunities in key departments throughout the store. Directional signs are placed near other feature exposition attractions and in prominent traffic locations referring visitors to these special exhibits.

In the Fashion field, for example, a sensationally exotic stylized hand carved plastic mannikin, "Miss Plastics," dressed in plastic wearables, symbolizes the genius of plastics engineers, chemists and technicians in the style world. Inspired by the beautiful characters seen in the Nutcracker Suite of Walt Disney's *Fantasia*, "Miss Plastics" unites the thousands of new synthetic fabrics and materials which make headlines in the modern apparel field.

Motion picture in color

Telling the story of plastics even more effectively, a salient attraction of the Exposition is a 35-minute Kodachrome sound motion picture, *The Magic of Modern Plastics*. Entertainment—in America's most popular way—this 16 mm. film with musical accompaniment, portrays the story of the quick and phenomenal growth of the plastics industry since the day when John Wesley Hyatt was searching for a new and cheaper material for the manufacture of billiard balls. For the first time, the audience is let in on the secrets behind the scenes. The actual tale of a plastic product from its origin in the laboratory, through the various manufacturing processes—blueprints, design, fabrication and finishing—until it makes its appearance on merchandise counters throughout the country is explained in lucid fashion. A professional running commentary makes the complicated technical procedure intelligible to a lay audience. Plastic testing is shown too, and the methods of estimating the unusual qualities of the materials are portrayed with graphic simplicity.

After the introductory sequence the newest applications of plastics as exemplified by the prize winning

pieces in the 1940 Modern Plastics Competition are presented in full color. The story of each prize winner is told in detail—what it is, how it is used, and what plastics have contributed to its appearance, salability and lowered production costs.

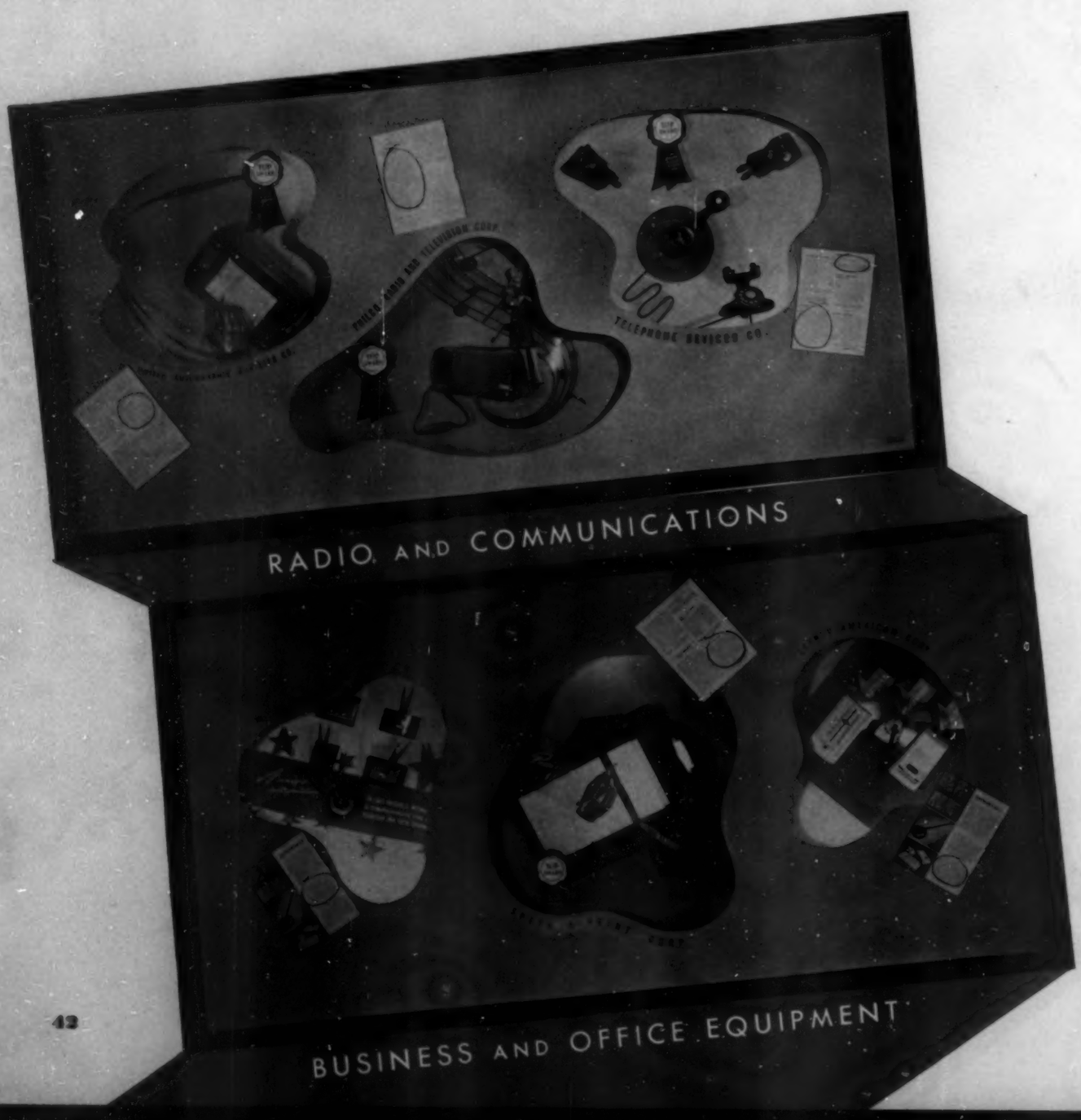
Exciting through every foot of film, the movie describes a new world of opportunity for American industry and the people who turn the wheels. No bias, no propaganda, no axe to grind, the movie carries a vital message to every businessman, brings a new vista of remarkable beauty and utility to every consumer. It has a spectacular magnetism that will draw thousands of visitors for a schedule of three to five shows a day.

Simultaneously, for presentation at local theatre and movie houses, a special professional 35 mm. newsreel edition of *Modern Plastics Preferred* in black and white has been prepared. An earlier production, in fact the first independent sound motion picture about plastics ever made, this motion picture has great documentary value. It, too, traces plastics production and history and, in an interestingly narrated script, explains the application of plastics for every industry.

Plastics Essay Contest

Each store that reserves and conducts America's Modern Plastics Exposition in their respective city will be authorized to conduct a prize essay contest for children and grown-ups on the subject of plastics in their trading area. Prizes will be provided at no cost to the stores through MODERN PLASTICS magazine. Local prize winners in every city will also compete for the Grand National Prize, valued at $1500.

Psychologically, the idea of America, the land of golden opportunity, has made America a "contest minded" nation, and we're mighty glad of it! Business and industry have learned the value of fostering ambition and invention and they will back to the hilt any



SPORTING GOODS GAMES AND TOYS
PHOTOGRAPHIC AND MUSIC
HOUSEWARES

NOVELTY AND MISCELLANEOUS
COSMETICS AND DECORATION
FASHION

Number one glamor girl of America's Modern Plastics Exposition, *Miss Plastics,* a full-sized, hand carved mannikin, is a glorified symbol of the beauty, genius and real practical value of plastics, particularly in the world of fashion. Inspired by the characters in the Nutcracker Suite section of Walt Disney's *Fantasia,* she represents an achievement of spectacular design and craftsmanship. She wears plastics from transparent bonnet to fancy slippers in chemically made finery—a celanese skirt is topped with a bodice of plastic sheeting and fastened with a plastic zipper, and her hose are nylon, of course. While *Miss Plastics'* costume is quite imaginative, plastic merchandise of every type is now an accepted fact in the apparel field

(*Please turn to next page*)

(*Continued from page 42*) stimulus. In plastics particularly—the youngest and most ambitious of all industries—there is a characteristic open-mindedness.

The Plastics Essay Contest is a splendid means of getting everyone to think and talk about plastics and America's Modern Plastics Exposition. Outstanding local celebrities, city officials or leading citizens recognized in educational or engineering activity, will judge local contests. Interesting and exciting, here is a starting gun for a charge of high-power publicity and headline showmanship. Prizes can be displayed in windows or interiors or in popular places in the city. Still and moving pictures of winners, radio interviews, newspaper and magazine writeups, can tell a story that will echo in booming sales and lasting goodwill.

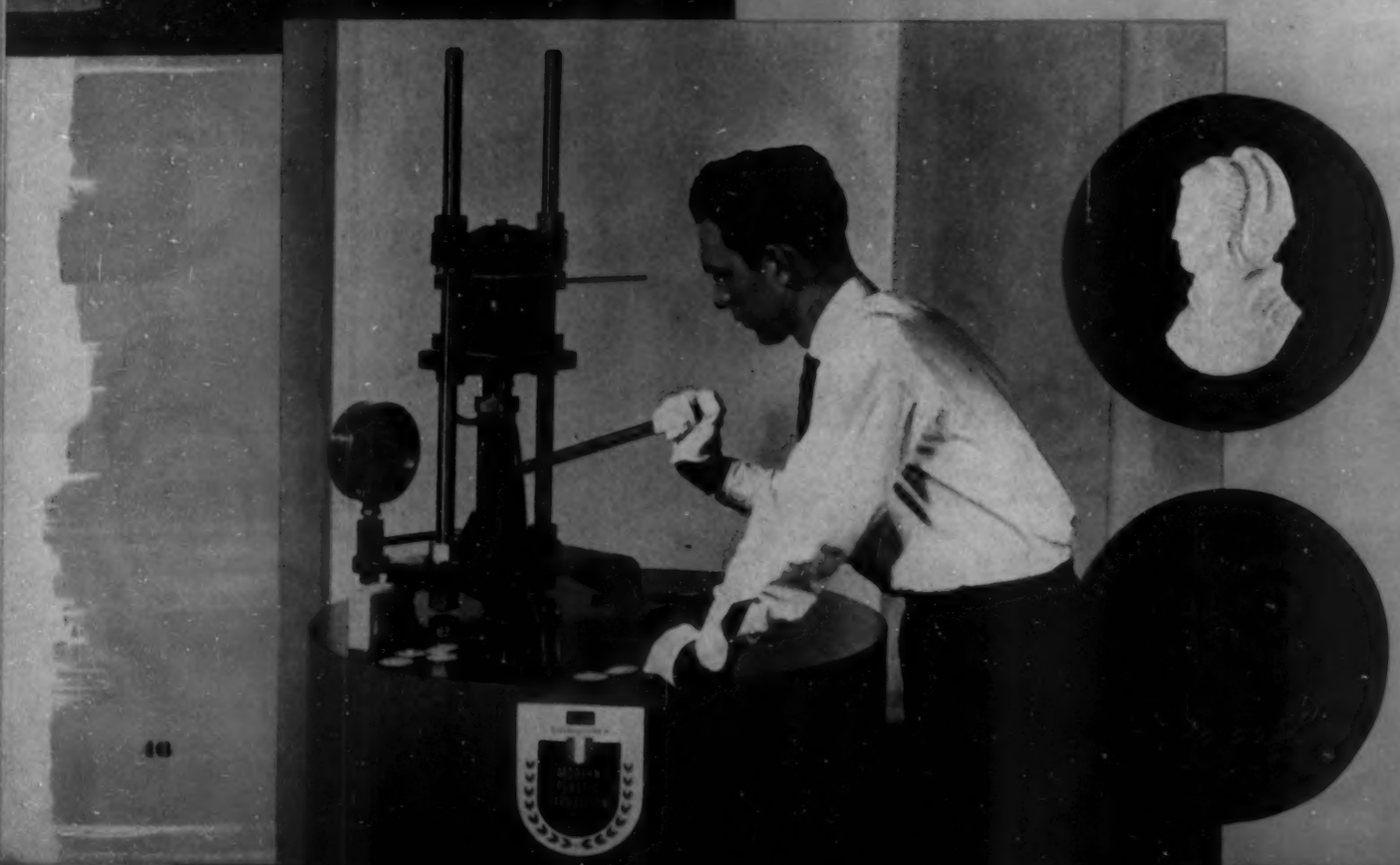
The Prize Essay Contest itself does not require a technical knowledge of plastics, or hours of research work in a library or laboratory. An original story of approximately 500 words expressing or projecting the future of plastics is the basis for entry. The contest has been planned to bring out the individual's idea of what part plastics are going to play in years to come—and why. A by-product of the imagination plus such comments as the contestant wishes to make about what was learned from his visits to America's Modern Plastics Exposition—that's what will be expected.

Three classifications have been designated to accommodate all age and educational groups. Group I is for grade school students; Group II for high school students; and Group III for university students and adults.

Three prizes in each group, totaling nine in each local contest, will be offered.

First prize—a General Electric Radio
Second prize—a Sheaffer Desk Set
Third prize—a matched set of streamlined handy desk accessories, by Zephyr American Corp.

The Grand National Prize is a one-year scholarship at the Plastics Industries Technical Institute, Los



Left: This plastic case of rare biological and agricultural specimens imprisoned in transparent plastic is one of the interesting scientific exhibits of the show. Below: Souvenir plaques of the Exposition molded on a small laboratory press bring the molding plant right into the store for first-hand observation

Angeles, including round trip bus transportation to the school from any point in the United States—and sufficient cash for living expenses while engaged in the course—a total value of over $1500.

A new school, planned to teach the practice as well as the theory of plastics, the Institute is staffed by specialists and offers a curriculum which covers molding, mold design and construction, casting, laminating, styling and merchandizing of plastics. Founded to meet the need for trained employees in this rapidly expanding field, this trade school is another indication of the plastics future. As the immediate goal of each Plastic Prize Essay contestant, the Grand Prize points the way to a worthwhile profession, more than egotistical glory.

Special exhibits

Emphasizing recent achievements in the plastics worlds, a number of outstanding individual educational exhibits have also been set up. One of these is a demonstration of the edge-lighting properties of methyl methacrylate showing the particular advantages of cold piped light made possible by the light-refracting ability of this plastic. The use of louvered plastic sheeting for lighting purposes, particularly to complement fluorescent lighting, forms an interesting part of the exhibit. An explanation of the development of polyvinyl resins as interlayers in modern safety glass for automobiles, aircraft, trains and homes, is demonstrated in a striking exhibit with meaning for everyone.

Another special exhibit, direct from the library of preservation of the Bureau of Agricultural Chemistry and Engineering of the U. S. Department of Agriculture, is a series of 15 rare, valuable biological and agricultural

Eye-catching displays with actual plastic products and decorations proclaim the presence of America's Modern Plastics Exposition

Did you know?
that
Alexander Graham Bell invented the telephone in 1876? . . .
It would have been impossible without PLASTICS for the functional parts.

Did you know?
that
in 1868 a U.S. manufacturer of billiard balls offered a $10,000 prize to anyone who could find a more suitable material than ivory? . . .
John Wesley Hyatt answered the challenge with celluloid — AN EARLY PLASTIC

Did you know?
that
J. Carbutt produced flexible film on PLASTIC SHEETS in 1889? . . .
Edison applied it at once to the making of motion pictures.

Mr. C. F. KETTERING tells us
Mr. HENRY FORD tells us...
structure of an Automobile Body,
except the tubular welded steel
frame of fibre plastic, and the
first experimental model will
be finished this winter."
Mr. GLENN L. MARTIN tells us
Mr. MORRIS SANDERS tells us
MODERN
PLASTIC
EXPOSITION

CHARLES F. KETTERING tells us

"For the first time in history man has learned how to make materials with the properties he wants instead of suiting his wants to the properties of natural materials. Such a fundamental change in our raw materials is certain to result in many changes in the products of industry. New industries with thousands of opportunities for employment are made possible by the new properties of Plastics. The chemist and engineer have again broadened our outlook for the future and removed limitations to a better living for all of us."

HENRY FORD tells us

"We will make the entire superstructure of an Automobile Body, except the tubular welded steel frame, of fibre plastic, and the first experimental model will be finished this winter."

GLENN L. MARTIN tells us

"I predict that Plastics will play an increasingly important part in the future of the airplane, and that we shall see spectacular results within the next two or three years. I believe that their ultimate use will bring closer together those uncongenial old factors—strength, lightness, and low cost—so critical in the airplane industry. Interesting applications of Plastics are already being made in airplane construction today, and there are immediate prospects of more important uses. Results obtained through the Glenn L. Martin Fellowship in Plastics at the Mellon Institute and researches in our own laboratories are already bearing fruit far beyond our original expectations. The horizon in this field seems all but unlimited."

MORRIS SANDERS tells us

"No group of materials in the world is playing as important a role in man's shelter, necessities and pleasures as is the expanding group known as Plastics. Even so, the role that they play today is only a prophetic suggestion of the part that they are about to play. Having worked closely with these materials over a period of years, I have been fascinated with their beauty, adaptability and remarkable range of properties.

"Plastics, by and large, are the most satisfactory materials with which a designer can work. They permit the easy execution of almost any structural or decorative idea—with a grace and originality possessed by no other group of materials."

specimens cast and preserved in blocks of crystal clear plastic. The exhibit is housed in a display case constructed with sheets of the same plastic.

Plastics in packaging, one of the most important outlets for plastics, forms the theme of a major exhibit. Packages and closures of every type, from transparent, opaque, stock items and special designs, boxes of every description highlight the display. The importance of plastics in this field has become increasingly significant under present conditions, particularly where strategic materials must be replaced.

Leading industrialists have recognized the significance of plastics in the American economic scene. Prominent names in business, engineering, invention, architecture and design with experience in plastics speak freely about its infinite potentialities. Photographs and quoted statements and predictions from such nationally known figures form no small part of America's Modern Plastics Exposition—and publicity channels are wide open for such material. Attractive plaques mounted on stands and trimmed with flaring plastic decorations reproduce the vital message of such men as Charles F. Kettering, vice-president of General Motors Corp.; Glenn L. Martin, president of Glenn L. Martin Co. and sponsor of a fellowship in Plastics at the Mellon Institute; Henry Ford, founder of the Ford Motor Co. and pioneer in the use of soybeans in plastics; Morris Sanders, noted designer and architect; and many others. What each has to say (see opposite) carries emphatic weight. Here is practical industry talking—from actual experience and understanding—not theory and speculative promotion.

Window displays

In conjunction with the main exhibit cases, exciting window displays completely different in design and construction carry out the theme of the Exposition, "The Dawn of a New World." A sure-fire threat to sidewalk safety—each different and unique—they embody startling original display technique and ingenious use of modern materials. Revolving, animated moving parts, colorful plastic backgrounds, fluorescent lighting, set the stage for an array of plastic products and raw materials that catch the attention of the speediest window shopper and non-stop passerby.

Polaroid windows which work magic in small areas of space exemplify another phase of modern display technique made possible through plastics.

Store decorations

Emblems in brilliant colors repeat the theme and insignia of the Exposition. The feature emblem is an impressive shield which decorates all the fixtures and equipment and also has been built in deluxe illuminated shadow box form to accompany the show.

Posters and stoppers of the "did you know" type flag attention to the exhibit. Amusing caricatures (see page 47) tell just enough to pique the curiosity and whet the appetite for more information.

Ten large flags, all bearing the emblem of America's Modern Plastics Exposition, (*Please turn to page 106*)

Growth of plastics

United States census statistics reveal industrial activity in synthetic molded, cast and extruded aterialm

THE Bureau of the Census, as official record keeper of the Nation's economic activities, has compiled statistics on the physical volume and value of products of synthetic plastics since the beginning of the industry's development in the United States. The plastics industry originated in the United States in 1869 with the production of celluloid by Hyatt Brothers in Albany, New York. The U. S. Census of Manufactures for 1880 reported eight establishments producing plastics and fabricated products to the value of $1,261,540.

Statistics from the U. S. Census of Manufactures record the production of plastics in their crude or primary form in the Plastic Materials industry and, additionally, data on fabricated plastic products which are used in radios, automobiles, paints and varnishes, rayon, and many other products. The quantity and value of fabricated plastic products are difficult to determine accurately, due to their uses as parts and accessory articles in many industries, but the total value amounts to several hundred millions of dollars annually, as will be later indicated.

Table 1 shows the steady expansion in the production of plastic materials, reporting an output of 183,609,797 lbs. with a value of products of $79,752,810 in 1939, or considerably more than double the value in 1929. The true growth of the industry has been even more rapid than indicated by these figures because census statistics in Table 1 for the earlier years from 1880 to 1909 included data on fabricated plastic products, whereas the figures for later years represented only plastics in their crude form manufactured in the chemical industries.

Census statistics show not only the growth of plastics but also changes of an internal character from one type of plastics to another, as a decline in production of nitrocellulose while coal-tar resins and cellulose acetate have been expanding in volume. The basic substances from which nitrocellulose is derived are wood pulp and cotton linters. Nitrocellulose, more commonly known as pyroxylin, was for many years the leading type of plastic and its production reached a high during the post-war year of 1919. Cellulose acetate is derived from cotton linters and has expanded considerably in production in recent years, its 1937 total, for the first time, being greater in pounds than that of nitrocellulose. (*Please turn to page 98*)

TABLE 1. PRODUCTION OF PLASTICS IN THE CHEMICAL INDUSTRY, 1880 TO 1939

		Nitrocellulose							
		Made and Consumed in Same Plants,	Produced for Sale		Coal-Tar Resins[1]		Cellulose Acetate		Other[2]
	Total Value	Pounds	Pounds	Value	Pounds	Value	Pounds	Value	Value
1939[3]	$79,752,810	2,149,479	11,206,637	$ 8,495,519	152,121,989	$29,406,947	20,280,171	$11,811,193	$30,039,151
1937	61,877,690[4]	3,271,971	14,850,817	12,526,206	131,568,162	23,583,627	18,923,663	12,199,744	13,568,113[4]
1935	38,919,266	2,958,859	13,340,660	10,682,358	87,718,953	15,672,401	10,395,290	7,986,489	4,578,018
1933	19,884,426	2,849,523	10,096,033	7,799,283	41,556,515	7,508,587	2,874,819	2,245,543	2,331,013
1931	21,211,466	3,001,330	12,008,439	11,113,618	33,818,000	7,282,000	[5]	[5]	2,815,848[5]
1929	29,213,212	4,856,625	16,990,802	17,266,323	[6]	[6]	[6]	[6]	11,945,889[6]
1927	21,401,510	3,205,687	16,298,023	14,409,668	[6]	[6]	[6]	[6]	6,991,842
1925	23,590,814	4,156,313	13,703,156	13,720,802	[6]	[6]	[6]	[6]	9,870,012
1923	27,402,110	3,671,794	23,980,116	17,682,049	[6]	[6]	[6]	[6]	9,720,061
1921	13,966,108	[7]	21,678,285	13,966,108	[8]	[8]	[8]	[8]	[8]
1919	24,666,175	[7]	33,914,377	24,666,175	[8]	[8]	[8]	[8]	[8]
1914	12,654,883	[7]	[7]	12,654,883	[8]	[8]	[8]	[8]	[8]
1909	7,472,732	[9]	[9]	5,682,379[10]	[9]	[9]	[9]	[9]	1,790,353[10]
1904	3,949,124	[9]	[9]	2,136,976[10]	[9]	[9]	[9]	[9]	1,812,148[10]
1899	3,191,330	[9]	[9]	1,526,572[10]	[9]	[9]	[9]	[9]	1,664,758[10]
1890	2,575,736	[9]	[9]	[9]	[9]	[9]	[9]	[9]	[9]
1880	1,261,540	[9]	[9]	[9]	[9]	[9]	[9]	[9]	[9]

[1] The 1935 and 1937 Censuses of Manufactures subdivided coal-tar resins, showing separate statistics as follows:

	1935		1937	
	Pounds	Value	Pounds	Value
Phenol and/or cresol	52,326,946	$9,929,904	89,944,210	$16,762,554
Phthalic anhydride	17,900,745	2,946,897	25,561,432	4,530,695
Other coal-tar resins	17,491,262	2,795,600	16,062,520	2,290,378

[2] Includes synthetic rubber.
[3] The 1939 figures are preliminary and subject to revision.
[4] Revised.
[5] Value of cellulose acetate included in value of "Other."
[6] Value of coal-tar resins and cellulose acetate included in value of "Other."
[7] Figures not available.
[8] Figures not shown separately; combined with Rayon and Allied Products.
[9] No data.
[10] Includes data for fabricated plastic products.
Source: U. S. Census of Manufactures.

Announcing

SIXTH ANNUAL MODERN PLASTICS COMPETITION

SHOULDER arms—but direct your line of march toward Modern Plastics' Hall of Fame! Modern Plastics Competition time is approaching, so for the sixth consecutive year you are invited, one and all, to prepare your wares for the great event. Originally designed to stimulate, foster and further progress in the plastics industry, the Competition has grown to such tremendous proportions that its influence is felt throughout the length and breadth of the United States. Each year the number of entries has increased, until last year the Competition Hall was filled to overflowing with over 3000 items, made in all types of plastic materials.

Many new factors and the experience of five years have been skillfully blended in the arrangements that have been made for governing the 1941 Competition. The vastness of the event has made it imperative that more thorough planning, faultless systems and the closest supervision be the watchwords of its guidance. Exhibits of competition winners have been sent to Washington, D. C., to schools and museums everywhere. A huge program of publicity through newspapers, direct mail and every other possible medium has been developed to keep Competition winners in the public eye. The normal evolution of the industry in a period of twelve months brings into existence impressive numbers of new molded and fabricated plastics many of which incorporate entirely new designs and new uses of the materials. The problems of yesterday become the prize winners of today!

The current momentum of the plastics industry promises to make the Sixth Annual Competition an even more interesting affair than heretofore. Aside from the indirect effect of the accelerated tempo brought about by the defense work, many of the materials form integral parts of specific military equipment.

Some idea of the rate of the industry's development will be gained from the fact that the 1941 Competition will require 18 entry classifications as against 14 for last year. New classification groups have been added, and others from last year have been divided into new categories to facilitate the judging. Classifications appearing for the first time this year are: Displays, General Housewares (which includes such utility items as tea strainers, cutlery, dust pans, etc.). Major Household Appliances comprising the larger pieces needed in the home such as washing machines, vacuum cleaners, refrigerators, etc., Jewelry and Novelties, Military and Defense, Objects of Art which takes in vases, sculpture and other art luxury items, and Packaging and Closures. This last group will be important this year because of the number of metal packages which will undoubtedly be made of plastics because of Priorities on metals. The complete list of classifications and instructions for entering follow on the next page.

How to enter the Competition

WHAT MAY BE ENTERED: Any plastic application which has been designed or has reached the market since September 1, 1940.

WHO MAY MAKE ENTRY: Entry in Modern Plastics Competition is open to all plastic-using firms, designers, molders, laminators, fabricators, materials suppliers, machinery and die makers, and to others responsible for the creation or manufacture of the plastic unit entered.

NO ENTRY FEE: There is no entry fee but it is understood that all entries are to be submitted complete and in good working order and will remain the property of MODERN PLASTICS, to be placed in the permanent exhibit maintained at its offices, 122 East 42nd Street, New York City.

CLOSING DATE: All entries must be in our offices on or before September 8, 1941, regardless of the postmarked date. The judging will take place on or about September 10.

NUMBER OF ENTRIES: Any number of different entries may be submitted by any firm or individual.

ONE BLANK PER ENTRY: If you are planning to enter more than one plastic product or part, write now to MODERN PLASTICS for your entry blanks. A separate blank must accompany each entry except where duplicate items are submitted to show color range or where several items are to be grouped and judged as one, such as a set of jewelry, condiment sets or other similar groups.

FULL INFORMATION: No entry will be accepted for judgment unless accompanied by a completely filled out and detailed entry blank which has been signed both with the company and individual name.

WINNERS: To be announced in the November 1941 issue of MODERN PLASTICS magazine. Awards will be made in accordance with plans to be announced at that time.

ALL ENTRIES MUST REACH OUR OFFICES ON OR BEFORE SEPTEMBER 8, 1941

Classifications

1. Architecture
2. Business and Office Equipment
3. Displays
4. Furniture
5. General Housewares
6. Major Household Appliances
7. Lighting
8. Industrial
9. Jewelry and Novelties
10. Military and Defense
11. Objects of Art
12. Packaging and Closures
13. Radio and Musical Instruments
14. Scientific
15. Sporting Goods, Games and Toys
16. Transport
17. Wearing Apparel
18. Miscellaneous

(Complete description of each group will be found in the entry form)

FILL OUT COUPON BELOW AND MAIL TODAY TO OBTAIN ENTRY BLANKS

SIXTH ANNUAL MODERN PLASTICS COMPETITION
Sponsored by MODERN PLASTICS MAGAZINE
BRESKIN PUBLISHING CORP.
122 East 42nd St., Chanin Bldg., New York

Please send me.....entry blanks.

Name (Company Name).....

Address.....

Date.....

Signature.....

THESE SIX JUDGES WILL CHOOSE THE WINNING ENTRIES IN THE 1941 MODERN PLASTICS COMPETITION

ALFRED AUERBACH

Alfred Auerbach, editor of *Retailing*, where for 12 years he has put out its authoritative Homefurnishings section, section, served so well on the 1940 jury that we have asked him to return again this year. His interest in the relationship between machines and design and knowledge of marketing and distribution have made him sought after to judge awards of this type. Mr. Auerbach acts in advisory capacities to a number of schools concerned with design and merchandising.

JOHN M. De BELL

John M. De Bell, consulting chemist on plastics, has long been a frequent contributor to MODERN PLASTICS editorial columns, particularly in the Technical Section. His experience has been varied both in this country and in Europe where he has worked with all classes of materials, and assisted in developing many plastic raw materials and products. Mr. De Bell is also well known for his research work.

HARLEY J. EARL

Harley J. Earl, vice president of General Motors Corp. in charge of styling, is a welcome addition to our jury. In his capacity of Style Chief, he directs all design and color work for that company. Mr. Earl received his early training in his father's own factory, the Earl Carriage Works, and is a graduate of Leland Stanford University. His early association with General Motors was as director of the Arts and Color section, created in 1927, renamed the styling section in 1937.

Raymond Loewy, industrial designer, has made extensive use of plastics in the fields of transportation, product and specialized architectural design. A graduate engineer from Paris University, Loewy started his career in the United States in 1920 as a fashion illustrator. He has received recognition by awards in the 5th Annual Modern Plastics Competition, 1938–1939 All-America Package Competition, 1938 Annual American Design Contest and is Honorary Royal Designer to Industry (Great Britain) and Officer Legion d'Honneur (France).

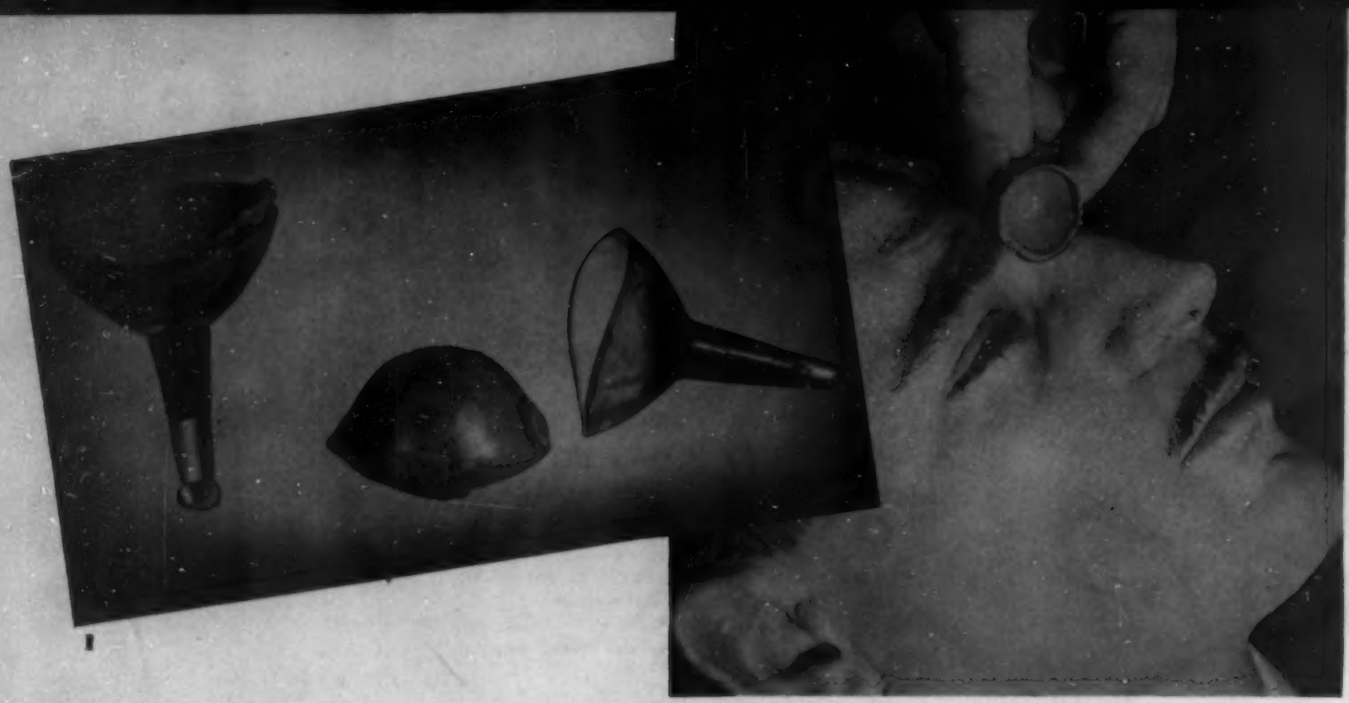
Earl F. Lougee scarcely needs an introduction to devotees of MODERN PLASTICS magazine, who remember his five years' service as Editor. At present he is Chairman of the Executive Board of the Plastics Industries Technical Institute. Mr. Lougee has not only a thorough and intimate knowledge of the plastics industry but, in addition, his broad experience in design, and acquaintance with the workings of earlier competitions eminently qualify him as a contest judge.

Morris Sanders, architect and decorator, is serving his fifth year as a member of our jury. Arkansas born and bred with Yale as his Alma Mater and Europe his field of study in design and architecture. He was awarded the silver medal for domestic architecture in 1936 by the Architectural League of New York; Pittsburgh Glass Institute Award, 1937; Modern Plastics Competition Awards, 1937 and 1940.

MORRIS SANDERS

EARL F. LOUGEE

RAYMOND LOEWY



1

2

Complete plastic contact lens

COMBINING the scientific knowledge of the lens manufacturer with the technical skill of the Plastics industry has resulted in an achievement for both in all plastic contact lenses. A covering for the eyeball to improve human vision, the plastic lens is the latest development in the search for the perfect cornea covering begun in 1827 when a "glass shell" to protect the eye from infection was suggested by that eminent English astronomer, J. F. Herschell.

According to Theodore E. Obrig, who has done intensive research for twelve years in the field, this new all-plastic opthalmological discovery is superior to the glass contact lens primarily because it fits nearly perfectly and generally takes no more than five minutes to adjust. These plastic lenses are practically unbreakable, weigh 60 percent less than glass and will allow better light transmission.

The manufacture of the methyl methacrylate plastic contact lenses involves the basic steps undertaken in practically any normal molding operation, although the methods are obviously different, requiring, as they do, scientific supervision and the most precise aseptic procedure. Often it is necessary to incorporate complex, compound optical curves to correct a deficiency in vision.

Mr. Obrig is convinced that the only successful method of fitting contact lens is by taking a cast, or mold, of the eye. In order to make this delicate operation, Negocoll, a soft sponge-like material imported from Switzerland, is used. Heretofore, in the manufacture of glass contact lens, the shape of the lenses was determined by fitting trial lenses to the eye. A wide range of sizes was necessary and then a perfect fit was doubtful. According to textbooks, the diameter of the cornea is about 11 to 12 mm., and any cornea over 13.5 is abnormal. Accepting this, all lens manufacturers, therefore, did their grinding with a standard corneal portion of 12 mm. Furthermore, the corneas were often thought to be round. Obrig's research and experimentation determined that the corneas were not round, but slightly oval, and that the average cornea was not 11 to 12 mm., but, in reality, much larger. His measurements of over 1000 castings revealed an average of 12 by 13.6, and that over 40 percent of the corneas were 14 mm. and over. This finding disclosed that the 12-mm. standard cornea diameter was unsatisfactory in the majority of cases.

The lack of success with contact lenses has been attributed by specialists to the annoyance and discomfort suffered by the patient in the three to ten fittings necessary before a satisfactory adjustment was made. In most cases many changes had to be made and often the lenses could not be worn for long periods of time.

In having the all-plastic contact lenses made, the patient suffers little discomfort. An impression is made of the eyeball with the sponge-like material, Negocoll, heated to approximately 105 deg. (Fig. 1). While the patient is in a reclining position the operator places the Negocoll, which is held in a casting shell, into the eye (Fig. 2). The casting shell is placed under the upper lid first, then under the lower lid. When the casting shell holding the Negocoll is under both lids, the first step in taking the impression is completed. When the casting is removed from the eye, it is then, in effect, a negative mold. It bears the impression of the eye with every variation, undulation and surface measurement accurately reproduced in the material.

The next step is to make the positive part of the mold, the working unit, which will serve for manufacturing the final lenses. This is done by making a dental stone casting (Fig. 3). The dental stone, a plaster-like material, is placed in the negative Negocoll impression. It is allowed to remain there about twenty minutes to permit it to harden. As a precautionary measure, two castings are usually made in this manner, in case one should become lost or broken in the subsequent operation. The completion of the lenses from this point on follows conventional precision technique.

In this procedure, the dental stone acts as a mold, or forming block. Methacrylate sheets are cut to approximate sizes and placed over the stone impression. Brass cavities are used for the female half of the die. Since these are forming the outer surface, it is only necessary that they be of the approximate contour of what the finished lens is to be. They are then subjected to heat and pressure. This causes the plastic to be shaped the exact contour of the dental stone casting. After this operation, the molded methacrylate sheet is trimmed to size and, in the vernacular of the molder, the flash is removed and the piece sent to the finishing department—an essentially important step.

The same skill and care employed in the finishing of any good molded product are not enough. The lenses must possess perfect optical properties if they are to serve their purpose. (*Please turn to page 108*)

1—Manufacture of contact lenses involves basic molding procedure under close scientific and aseptic supervision. Left—An acrylic casting shell is used to hold Negocoll, a soft spongy material which enables operator to take impression of eyeball. Center—Negocoll removed from the casting shell (right) after the impression. **2**—Patient in position demonstrating step in making negative mold. Negocoll being pliable and impressionable insures exact duplication of eye's surface. **3**—In the center is dental stone casting made by putting this material (while in plastic state) into Negocoll impression. The hardened dental stone acts as male portion of mold. Other pieces are rough acrylic squares which have been molded. **4**—Finished acrylic contact lenses, ready for insertion, have been trimmed, ground and polished to exacting optical prescription

PHOTO COURTESY ROHM & HAAS, INC.

Coaster-ashtray

Bridge players who are real fiends when it comes to inconvenience at the bridge table will doubtless welcome the Grandslam, combination coaster-ashtray that is being molded of phenolic plastic. The cavity in each of these units that acts as a receptacle for the ashes is in the shape of the respective suits of the bridge deck, namely, clubs, diamonds, hearts and spades, and is approximately 1 in. deep. There is plenty of edge all around each opening so that the cigaret can be rested on the tray without danger of its falling off. The tray forms the bottom part of the unit when closed, but it can be swung out into position as a coaster. Each coaster has 6 raised ribs which prevent the glass from resting in any moisture that may run down from the glass and accumulate in the coaster. The tray and coaster are, of course, individual units and are molded separately in two 4-cavity molds. They are joined by a single screw construction. Available in mottled brown, black and maroon, these units are highly practical, for the phenolic material is impervious to alcoholic and fruit beverages as well as others, and will not be scarred by cigarets. They have a high, lustrous finish which will not wear off, are unbreakable and easy to clean. Despite the fact that these accessories carry bridge motifs, they're convenient to use anywhere.

Credits: Textolite molded by Plastics Dept., General Electric Co. for Mutual Press, Incorporated

Product Development

Screw driver grip

Molded plastic handles for tools are not new, but ever since they were first introduced their success has been constant. A new, durable screw driver grip molded of transparent cellulose acetate is sturdy, tough and pleasant to the touch. Four interchangeable bits enable the driver to be used with various sized cross-slot screws, with the extra bits kept always in sight and near at hand in the unique clear hollow hand grip. It is claimed that hard blows or even the worst abuse do not affect the smooth luster of the plastic. The molding is done by a one-shot process worked out by the molder. The metal shaft is inserted in the die and the handle is molded around it, thus assuring an extremely tight and lasting fit. At the same time the cap which screws on the end is molded in the same die. Assembly consists simply of removing the screw, and screwing on the cap. The development of the crosshead screw made the construction of a new type of handle necessary and desirable. Available in several colors, the handles are easy to grip. There is no paint to chip off as is the case of wooden handles. Resistant to chipping and splintering, these plastic handles are long-wearing. Dirt, grease and oil can be easily wiped off since the plastic is not porous and it will not slip from the hand in use.

Credits: Fibestos molded by Worcester Moulded Plastics Co. for Parker Wire Goods Company

Light reflecting alphabet

Molded methyl methacrylate house numbers and letters that reflect light without glare and withstand the onslaughts of outdoor exposure have recently been put on the market, selling at a very reasonable retail price. These numerals are illuminated in clear outline at night by light from street lamps in the usual village or suburban arrangement. They are not only visible in direct front view, but from a wide angle as one approaches from either side. Made with a series of tiny parabolas or saucer-shaped patterns in relief on the reverse side, the numbers are backed with thin metal and outlined by a plain, transparent rim of the plastic. Each saucer area acts as a minute controller and reflector, not only shooting light back toward its source, but causing the whole numeral area to glow as though illuminated from behind. Because this plastic has the property of internal reflection, light penetrates the flat part of each saucer shape but cannot penetrate the curved sides and so is concentrated within each tiny circular area. Legibility of the numerals is further aided by the contrasting plain surfaced rim outline. Daytime legibility is claimed to be excellent and it is said that there is no variance in legibility. Made in 2 in. and 3 in. heights, these aid in obtaining quick help at night in case of fire, illness and other emergencies.

Credits: Lucite molded by Arpin Products, Inc., for Lumelite Co.; designed by Lawrence Freeman & Associates.

Product Development

Electric iron handle

Heat-resistant, smooth, durable phenolic handles for the Sunbeam iron master are produced in an intricate, economical 4-cavity horizontal-flash mold. To get the "cut-out" form for the handle, it was necessary to construct a split cavity die and consequently inserts had to be loaded on the plunger. The cavity is nested in a yoke and is raised from the yoke by bottom push-outs. When raised, the front split section of the cavity falls away from the molded piece, thus permitting the part to be taken from the cavity by hand. All inserts are rapidly loaded on the plungers at the top of the mold by means of specially built fixtures, which are filled on the bench by the operator and then placed in the press for the loading operation. The 7 inserts for each of the 4 pieces (28 in all) are anchored simultaneously in the mold. Along with loose powder which is deposited by ingenious devices in correct amounts in each cavity at the same time, preforms are used. Placed in the mold by hand, these preforms act as rams to spread the loose powder throughout the entire mold. Flash is removed by hand scraping and flexible shaft sanding. Sand and trim markes are removed by buffing. The window for the control knob is cut out by a special cutting tool. The finished handle is sleek, comfortable and adds little weight.

Credits: Bakelite phenolic, molded by Chicago Molded Products Corp. for Chicago Flexible Shaft Company.

"Confucius says..."

The fad of quoting all sorts of proverbs purported to be from the lips of Confucius has gone the way of all fads, but the real teachings of this wise, old philosopher continue to live on as they have for centuries. Now, we find Confucius made of plastics. In gay colors, the figure stands about 17 in. high and is resplendent in its vivid shades and tints when lighted from within. The original model for the figure was made by Yun Gee, a Chinese-American artist, well known in China, the United States and Europe for his paintings. His works can be found in a number of important American and European collections. Mr. Yun Gee has painted several murals among which are *The Last Supper* executed for St. Peters Lutheran Church in New York; another, *The Spirit of Chinese Resistance*, painted for the Chinese Youth Association under the sponsorship of Generalissimo Chiang Kai-Shek. Hollow and lightweight, the figure is made of cellulose acetate flakes which have been mixed with various plasticizers and other ingredients. The colors are an integral part of the material and the shadings achieved are artistic, indeed. Mounted on a wood base, the figure can be lighted from within so that it glows pleasantly. The plastic is very durable since it is resistant to water, alcohol and is very slow burning. We are told that these figures are to be sold for Chinese relief funds.

Credits: Marolin fabricated by Czecho Peasant Art Company.

Product Development

Phonograph attachment

Turning the modern radio into an electrical phonograph, the RCA Victor "tear drop record-player" helps fill in those "off" hours when no radio program fits your mood. It permits unlimited encores for old favorites—from swing to Wagner. Housed in a sturdy, decorative molded phenolic cabinet with a lightweight matching tone arm of the same plastic, the unit made in a mottled brown will be appropriate in any interior. Compact, the one-piece case measures 8 1/4 in. deep, 12 in. wide and 5 1/4 in. high. A molded combination volume control knob and on-off switch is located on the side of the cabinet. Capable of playing either 10 in. or 12 in. records at a volume and fidelity commensurate with that of the A.C. radio set to which it is attached, the player has a constant speed motor which rotates the turntable at a twirl of a finger. An improved feature touch crystal pickup rides safely within the molded tone arm. The smooth surface of the plastic will not scratch other furniture and is permanently finished. It is easy to keep clean merely by wiping the surface with a soft cloth—and it will not chip or tarnish or react to room temperature. As a perfect host you can furnish your guests with his favorite recording, content in the knowledge that it will be smoothly played and a welcome change from the radio.

Credits: Bakelite phenolic, molded and engineered by Mack Molding Co. for RCA Mfg. Company.

Neon sign frame

A plastic parallelogram for neon signs has been attracting considerable attention because of its use of translucent striated ivory urea material for one of the largest electrical sign frames that has ever been molded. The frame is made in a dimension larger than that of the neon and is illuminated from behind with a green tubing or any other standard color. Radiating brightly, it attracts attention to the whole window or counter in which it is placed, since the lighting effects are spread over a wide area. Measuring 25½ in. by 10½ in., the frame support eliminates the unsightly "tie-ups" formerly necessary in this type of sign. Protection for the tubing, simplification of installation and a lessening of the breakage possibilities are added advantages. Electrodes are hidden from view and neat fiber clips hold the neon tubes in place. Lightweight the frame has a wall thickness of 45/1000 in. on the face and 55/1000 in. on the sides. The mold for making this frame is polished inside and out so that no final finishing is required except the removal of the flash, and ejection pins were placed where they would not show through. There are no uneven surfaces to show up when the light is inserted. Both the hanging and standing types of sign frames can be produced from this same piece.

Credits: Bakelite urea molded by Northern Industrial Chemical Co. Designed by Austin & Austin for John Eichler Brewing Co.

Product Development

Re-use razor case

Playing a dual role has become a common thing for many packages, and a re-use package is a boon for the manufacturer as well as his customer. This molded cellulose acetate butyrate razor case offers the consumer a solution to the proverbial problem of what to do with old razor blades. It contains 2 compartments, one of which can be used for discarded blades, while the other supplies enough space to hold a new package. The sides of the compartments keep the safety razor in place. Ideal as a display package, the box has a lid which is hinged on its short axis and can be swung completely around until it forms a base for the case. When it is open, the contents are shown at the proper display angle. In its closed position, the container is streamlined, with the product name incised and wiped-in in white. Compact and very lightweight, the case is molded in 2 parts by a relatively rapid injection process, which was economical, too. Smart and practical as this package is, it has not increased the cost of the razor. Color and finish are permanent and the tough material will stand rough handling. Merchants will readily see the possibilities of this product as an ideal gift for Father's Day. It is actually something that the head of the house will welcome as a gift from the children—or will want to buy for himself.

Credits: Tenite II molded by Columbus Plastic Products, Inc., for Magazine Repeating Razor Company.

Darkroom light filters

ANGLE shots or stereotyped pose—the fate of the photograph depends to a large extent on its adventures in the developing room. Darkroom light filters, or so-called "safelights," have long been a menace to smooth, safe developing technique—until the molded plastic filter put an end to filter faults.

Hitherto, made of dyed gelatin or gelatin and paper layers placed between glass sheets, light filters were fragile, liable to fade and often affected by photographic processing solutions as well as moisture—all too frequently present near the darkroom light. With the adaptation of a molded methyl methacrylate filter, these complaints were overcome and the result is a product which is permanent under the most exacting conditions of actual use.

The method employed in manufacture has been to introduce a sufficient quantity of coloring matter into the molding compound so that the transmitted light has the desired spectral characteristics demanded. Adequate diffusing material is also incorporated to give satisfactory light dispersion.

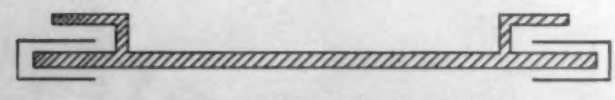
Most darkroom light boxes have a 5 by 7 in. light opening. A molded filter (Fig. 1) has been made in this size with a molded light lock permitting the filter to fit easily without light leakage at the edges. The filter is used preferably with the molded light lock on the outside, as in the diagram below.

The piece is made in a standard type, single-cavity compression mold with removable splits to take care of the undercuts involved in the slides. While the thermoplastic material could probably have been molded by injection, the molder informs us that this method was discarded because of the light characteristics desired in the finished piece.

For other sizes these light filters can be supplied in cut sheet form to order—square, oblong or circular (Fig. 2). When used in flat form, it is desirable to see that no leakage of white light occurs around the edges. The metal edges can be bent tight or black adhesive tape used to cover any light leaks.

There are several standard colors available and other varieties can be introduced for special purposes: Red—(deep shades) for orthochromatic films and plates; (light red) for varigam paper; Green—for panchromatic films and plates; Brown—for velour black and similar projection papers.

Credits: Lucite, molded by Norton Laboratories, Inc., for Defender Photo Supply Co., Incorporated.

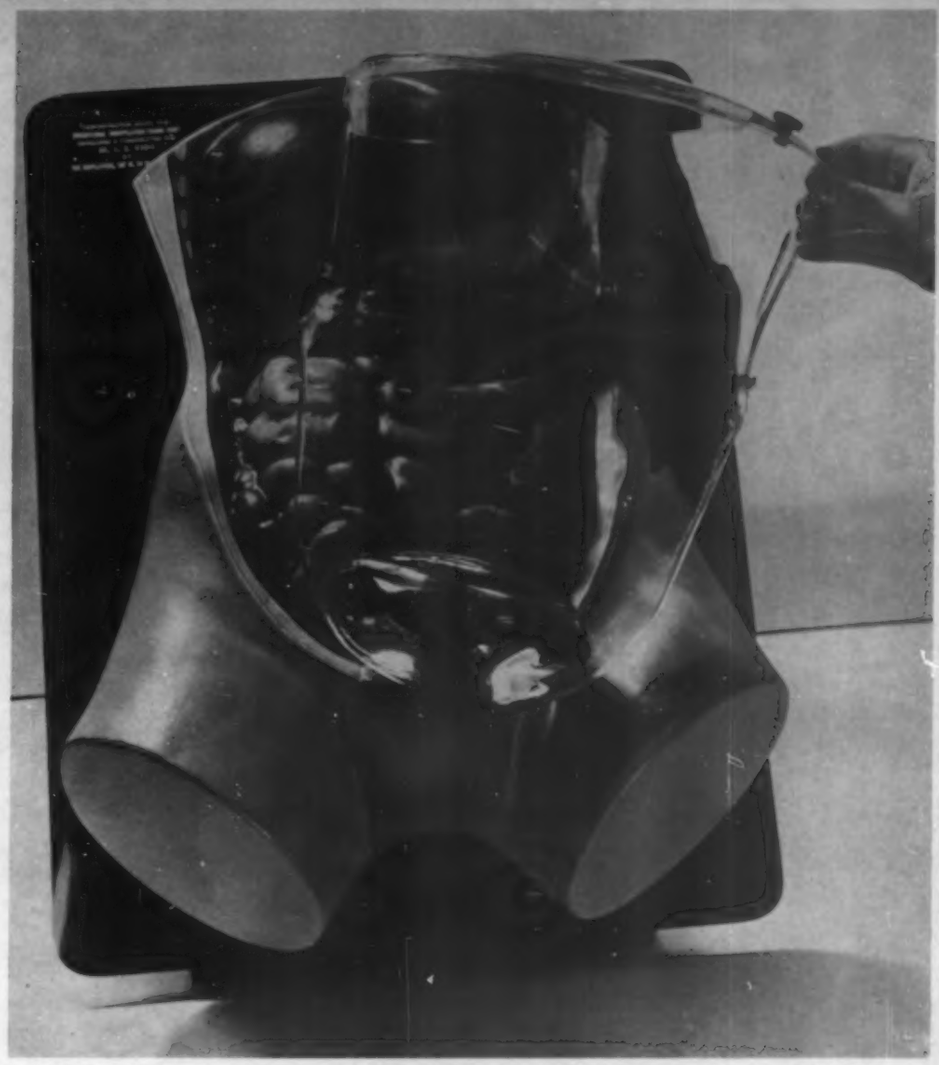


Cross section showing plastic filter in holder

1

2

Light, durable photo filters are made of methyl methacrylate resin in molded and sheet form



Developed to demonstrate the Rubin Uterotubal Insufflation Test to physicians and medical students, this anatomically correct model is entirely made of plastics. Illuminated from the rear translucent cellulose acetate, painted, forms the back section which includes the liver, stomach, colon, small intestines, etc. The front section is made of transparent vinyl resin sheet stock which forms a container for a liquid used in the medical demonstration. Lightweight and portable, the model is practically unbreakable and more realistic than those made of plaster, molded rubber or papier maché

Medical demonstration torso

by ROBERT P. MURRAY*

AN advancement in medical practice means little if it cannot be made universally available. Physicians can most graphically explain their methods and discoveries by actual anatomical model demonstrations. Such models have usually been so clumsy, heavy and breakable that they were confined to the schoolroom and it was simpler for the doctor to read or publish a prepared paper when he was ready to announce a new discovery. Moreover, most models were inadequate for illustrating internal functions. With the use of plastics, the physician or scientist can obtain a sturdy, portable life-size form which may be transparent or colored in natural shades.

Anatomically correct, this full-sized demonstration model was developed for Dr. I. C. Rubin, a well-known gynecologist, to demonstrate the Rubin Uterotubal Insufflation Test, which is a method of determining whether the Fallopian tubes are open or obstructed.

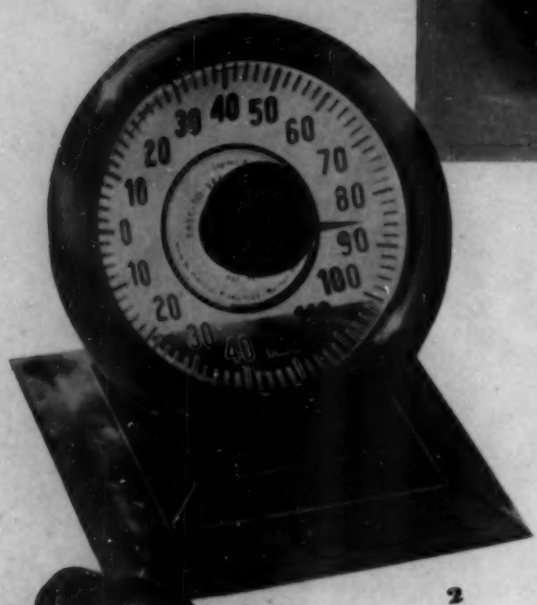
It is used in lecturing and demonstrations before various medical associations and conventions throughout this and other countries and also in teaching the method to other gynecologists.

The model is made entirely of plastics, and set into a display panel which is illuminated from the rear. The back section is all in one piece and includes the liver, stomach, colon, small intestines, etc. This part is cast in translucent cellulose acetate with a wall only about $^1/_{32}$ in. thick and then painted to resemble actual anatomical parts. Part of the interior was left clear to allow the light to pass through to the desired organs. This section presented quite a problem. Here is where the heavy weight and fragility of plaster made the latter an unsatisfactory medium. Molded rubber was not suitable because of its opacity. Papier maché was also considered, but the idea was discarded for the same reason and also because it was not possible to reproduce sufficient (*Please turn to page 100*)

*The Displayers, New York.

PLASTICS IN REVIEW

1



2

3

4

1 Practical ashtrays with two deep rests for your cigarets can be molded with individual or company trade mark or inscription. Ideal for holiday gifts or premiums, these trays are available in several colors from stock molds. Made of Durez by American Molding Company

2 A coil type thermometer that seems to be suspended in space has a protective ring and base of Lumarith. Mounted in 2 convex glass lenses, the dial can be seen from a considerable distance. Rim, $3\frac{1}{2}$ in. diameter. From A. H. Adams Company

3 Molded of Durez, these hand-painted, religious plaques represent a new development in religious art. Various opaque phenolic materials are used to secure the desired solid background colors. Lighter in weight than ceramic plaques, these plastic models are molded by Revivalist Press

4 Transparent picture frames to hold your favorite snapshot are of Bakelite polystyrene. Measuring $2\frac{1}{4}$ in. by $3\frac{1}{4}$ in., these frames are ideal for promotional or premium purposes. The window stock used to protect the photograph is Ethofoil. Designed by R. W. Dailey, they were molded by Amos Molded Plastics for Shell Oil Company

5 A three-barrelled beer scraper holder or container for soda-fountain scoops is fabricated of red and white Catalin. This handsome counter display in gay colors made for Hoffman Beverage Co. by Shoreham Mfg. Co. is color fast and sanitary

6 Cool and fresh looking, the upper name plate of this Horton ice cream flavor bulletin is fabricated of Monsanto cellulose acetate drawn into the form of the letters. Designed and manufactured by Design Center, Incorporated

5

6

7

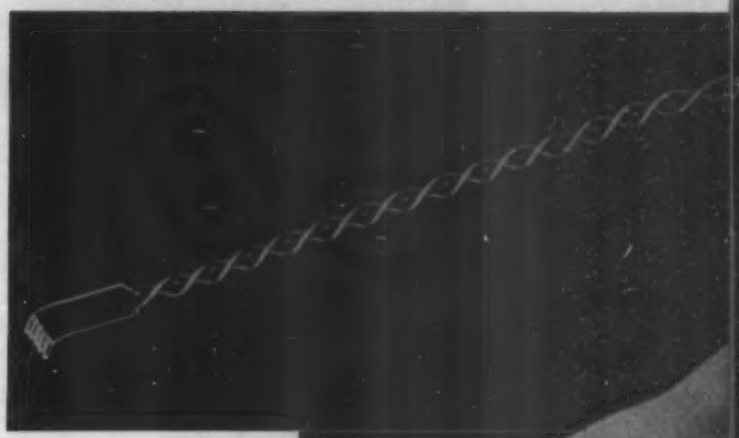
8

9

7 Watch your savings grow in this transparent Tenite bank. Illustrated both opened and closed, the bank can hold $16.75 in dimes, nickels and quarters if not opened before that. Of simple construction, 2 molded halves form a compact unit. These halves are joined by a lock operated by a tiny key. Molded by Remler Co., Ltd., for Bankers Utilities Company

8 It's a travel-ad that tells the same story in never-ending fashion. Sales message is printed on an illuminated, endless ribbon and passes before the prospect's view 3 times per minute. Housing is walnut Bakelite phenolic and Insurok and molded by The Richardson Co. End pieces are gilded

9 Press a tiny rod and salt or pepper drops out of a tiny glass jar. Called Pepsol the unit is set in plastic. Molded of Textolite by General Electric Co. for Imperial Metal Corp., plastic base and center dividing section is washable, and durable



10

10 Designed to take the place of imported bamboo back scratchers, these transparent Plexiglas scratchers are dainty, efficient "reachers for the hard-to-get-places." Designed and made by Al Ybarra

11 Novelty in business cards suggests molded Tenite ones, with the trademark, name and address in raised letters. Finished cards come out of the mold in a matter of seconds. They are a product of Minnesota Plastics Corporation

11

12 Merchandised as a premium with an antiseptic mouth wash, these Lucite tongue depressors have become a necessity item in the household. Injection molded 6 at a time by the St. Louis Plastic Molding Co. for the Lambert Pharmacal Co., the depressor tips are clear and flawless. Transmitting light around curves so that it comes out bright and cold at the end. Tip is illuminated by a magnifying lens bulb in the handle

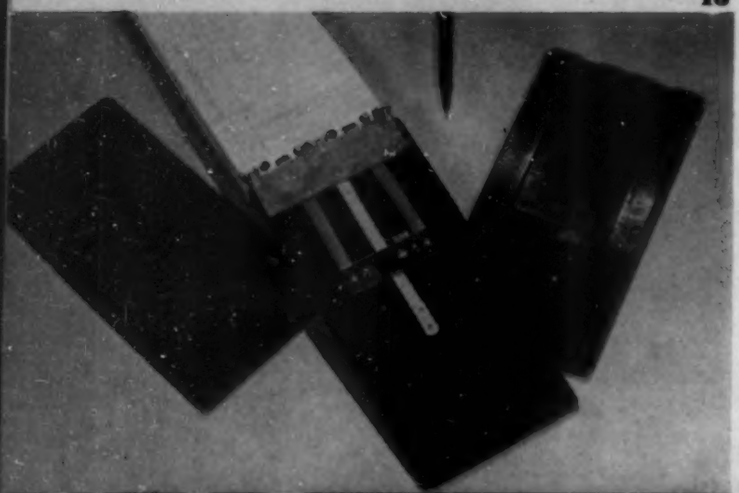
12

13

14

15

16



17

13 Plastics for cosmetic containers are becoming increasingly important. Here is a Max Factor Pancake makeup box molded of Monsanto polystyrene that's sleek, light and has a friction-fit top making thread arrangements unnecessary. Molded by Plastic & Die Cast Corporation

14 New "Eveready" Spot-Lite features a colorful 2-piece snap-fit housing molded of Bakelite polystyrene in maroon-ivory and red-black combinations. Translucent milk-white polystyrene is used for the lens which gives a diffused illumination and throws a strong beam. Molded by Boonton Molding Co. for National Carbon Co. Overall length is 3 inches

15 The eyes have it! An attractive eye shadow compact of clear Bakelite polystyrene resembles fine cut crystal. Replacing enameled metal cases, these boxes are fully resistant to the chemical ingredients of the cosmetic. Also used for cream rouge. Molded by Plastics Molded Arts, Incorporated

16 Practical covers for your loose leaf books, these are molded of Durez. Measuring $4\frac{1}{2}$ in. by 9 in., tough, durable, they will not split, tear or crack. A fine-grained black finish on the outside makes them easier to grasp. Molded by F. E. Reinhold Company for S. & D. Loose Leaf Company

17 Non-Spill batteries that can be repeatedly recharged and used for many years are encased in molded Monsanto polystyrene. Lightweight acid-proof spill-proof, the plastic housing affords protection against accidental breakage. Transparency of the material enables electrolyte level to be checked at a glance. Molded by Universal Plastics Corporation

18 Scoring a home run for safety, a plastic-lined cap brings protection against the "beanball" in the great American sport of baseball. Tough protective sheets of Plastacele are

18

PLASTICS IN REVIEW

19

zipped into pockets on both sides of the cap. Lightweight, but strong enough to distribute shock, the plastic is formed into a compound curve to fit the head. Developed by Dr. Walter E. Dandy, brain specialist at Johns Hopkins Hospital and du Pont technicians, caps are being used by the Brooklyn Dodgers

19 Cowboy hats and a high hat on a key chain are molded of Nixon cellulose acetate by Cruver Mfg. Co. Cowboy hats are distributed by Western Art Leather Co., for premium and novelty use. The high hats were used for Seagram's

20 Smooth "trigger" action features operation of a new No-Drip liquid dispensers. Combined cap and handle are molded of colorful Lumarith by Northern Industrial Chemical Co. for Medco Products

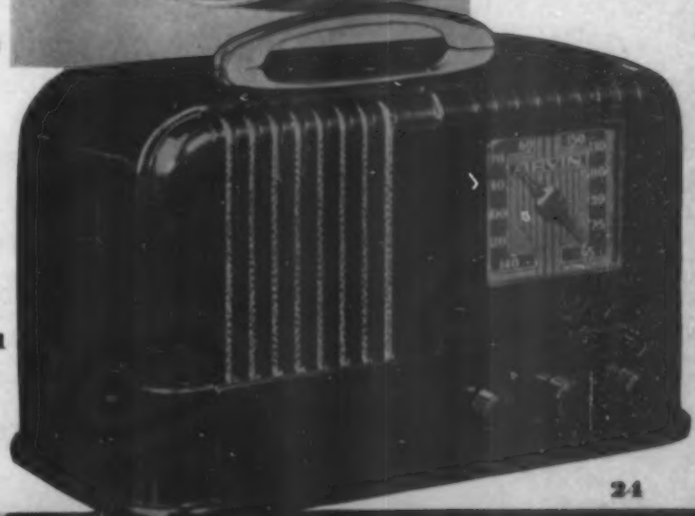
21 Compression molded housing for this Arvin radio is a lustrous walnut that is wear-resistant and attractive. Simple in design with 3 easy-to-reach control knobs and legible dial, the radio of Makalot by National Lock Company

22 Smart, new design in Sonora table radios employs Durez with smooth-flowing contours and eye-catching colors. These "Gems," measure $7^{3}/_{4}$ in. by $4^{1}/_{4}$ in. by $5^{3}/_{8}$ in. and weigh $4^{1}/_{2}$ lb. shipped. Molded by Midwest Molding & Mfg. Co.

23 Lightweight, convenient to use, practically unbreakable and unaffected by salad oils, acids or fruit juices, new salad sets of Lucite and Bakelite polystyrene are available in clear, green, rose and blue. Made by Plastic Creations and Plastics, Inc., respectively

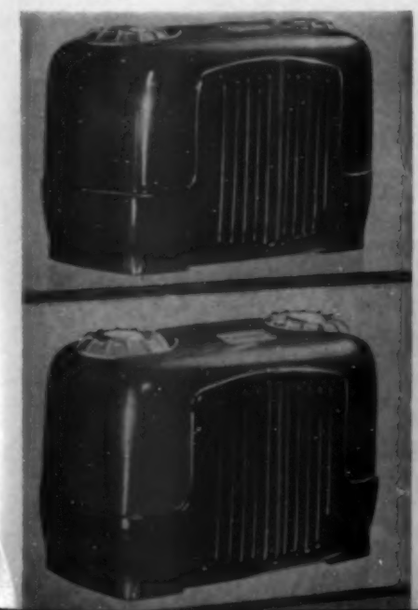
24 By simply adjusting the handle, any portion of a full cup can be accurately measured with this Tenite unit. Available in bright kitchen colors, it is molded by American Molding Co. for Harry Atherley & Company

20



21

22



23

24

Plaskon

HELPS THE DETROIT JEWEL Sparkle!

In the appliance showrooms of the nation there's a new note of sales-making interest . . . in the kitchens of America there's a new note of singing beauty!

It's the Plaskon Molded Color on the Detroit Jewel, one of the most attractive and popular gas ranges in America!

Modern styling in every detail has transformed the old-fashioned "cook stove" into this gleaming streamlined utility appliance. And Plaskon has helped this transformation through its use for oven and compartment door handles, burner and regulator knobs, and the unique combination housing for the lamp and time-reminder.

There are many features which make Plaskon Molded Color particularly adaptable to a job like this. Water, oils and organic solvents will not stain or otherwise affect its sparkling surface. Being solid molded color, its finish is permanent, and will not corrode, rust or tarnish. Neither scratching nor abrasion impair its color value. Though light in weight, it has great strength. Plaskon is smooth and warm to the touch . . . a valuable feature where there is repeated contact with hands.

Plaskon is the world's largest-selling urea-formaldehyde plastic, and is finding widespread use for the replacement of many materials essential in the defense program.

We shall be glad to give you the benefit of our technical experience in adapting Plaskon Molded Color to your production and sales-promotion program, where it may be an important factor in increasing profits. Write for a Plaskon representative to call upon you. Plaskon Company, Inc., 2121 Sylvan Ave., Toledo, O. Canadian Agent: Canadian Industries, Ltd., Montreal, P. Q.

Trade Mark Registered

PLASKON

★ MOLDED COLOR ★

The Detroit Jewel Gas Range, product of the Detroit-Michigan Stove Co., Detroit, Michigan. • Lamp and time-reminder housing molded by American Insulator Co., New Freedom, Pa. Handles molded by National Lock Company, Rockford, Ill.

Stock molds

SHEET ONE HUNDRED-SEVEN

Miscellaneous stock mold knobs and handles are adaptable for many uses. Assorted low cost finials in attractive colors—red, ivory, blue, onyx and bronze—are obtainable from stock without mold cost

---

1278. Cone-shaped knob, 1 1/2 in. diameter across top; base 3/4 in. diameter; height 2 3/8 in.; cone 2 1/4 in. deep; diameter 3/8 inch

1279. Hollow door handle, 6 1/2 in. overall length; metal strip insert 1/8 in. wide; 3/8 in. deep. Mounting hole centers in base 5 1/2 in. apart; 3/16–24 threads at each end

1280. Solid handle, 6 in. overall length; 5/16 in. metal strip; length of hollow ends 1 1/4 in.; depth 3/4 in.; threaded brass inserts

1281–4. Threaded faucet buttons 9/16 in. overall diameter; height 3/16 in.; with white wiped-in molded letters H(hot) or C(cold)

1285. Ball handle, 1 in. overall diameter; shank 7/16 in., diameter 3/8 in. long. End of shank molded plain or with 10/32 brass inserts

1286. Small knob, diameter across top 11/16 in.; bottom diameter 7/16 in.; diameter of top opening 5/16 in.; diameter bottom opening 1/8 inch

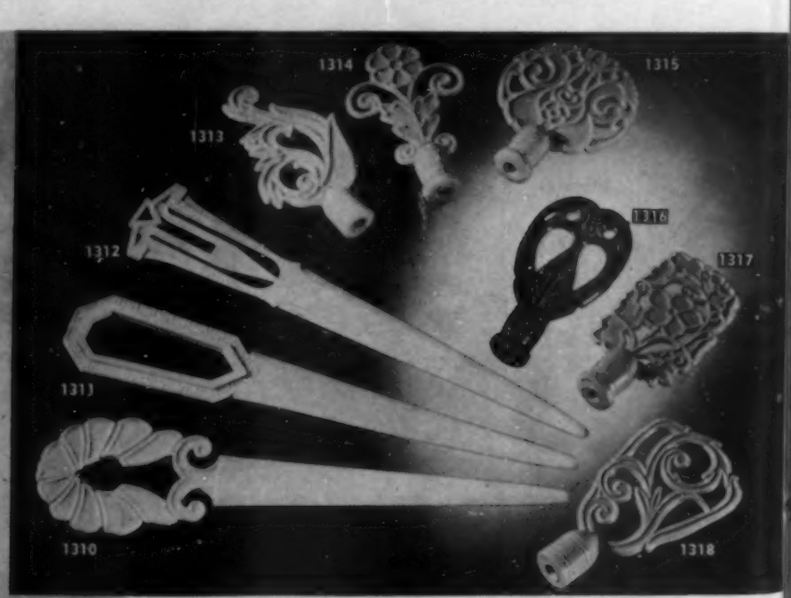
1287. Tapered knob, 3/4 in. diameter; 21/32 in. high; 6, 8 or 10/32 in. threaded brass inserts

1288. Knurled knob, 1/2 in. diameter with decorative top. Aluminum rivet inserts, or 6 or 8/32 in. threaded brass inserts

1310–12. Letter openers with decorative tops. Overall length 6 15/16 in. Blade tapers from 5/8 in. to 1/8 in. at tip

1313–18. Fixture and lamp finials with ornamental tops. Average overall height 2 13/16 in. Molded-in threaded mounting center, 7/32 in. diameter

Reprints of all stock mold pages which have been published to date with a complete index of suppliers are available to Stock Mold Service Subscribers



All molders are invited to send samples from stock molds to appear on these pages as space permits

Soybeans in plastics

by L. L. McKINNEY* and G. H. BROTHER**

Flow properties of a phenolic plastic modified with formaldehyde-hardened soybean meal

BY determining the amount of flow obtained when a certain amount of formaldehyde-hardened soybean meal or a corresponding amount of wood flour is added to a commercial wood-flour-filled phenolic molding powder, Brother and McKinney[1] showed that hardened soybean meal imparts more flow to the mixture than does wood flour. These workers[2] have also shown that a thermosetting molding material is obtained when formaldehyde-hardened soybean meal is used in admixture with a phenolic type plastic and that it is possible to use soybean meal as an extender for phenol in phenolic molding powders.

Phenolic resins in the A or B stage act as plasticizers for hardened soybean meal and thereby impart flow to the material during the molding operation. However, when the resin sets up, it can no longer plasticize the hardened protein present in the meal, and plastic flow stops. Plastic flow obtained during the molding operation will depend on how well the hardened protein is plasticized by phenolic resins. Actually, it has been observed that such resins are only fair plasticizers, and if more than an equal part of hardened meal is used with the resin, a stiff material is obtained. Further research may show that some treatment of the meal other than with formaldehyde will yield better results. For example, deamination with nitrous acid destroys some of the water-absorbing groups of the protein and gives a product more easily plasticized with phenolic resins than when formaldehyde is used.

Method of determining flow property

In this paper, flow properties of a wood-flour-filled phenolic molding powder are compared with those of a phenolic plastic modified with formaldehyde-hardened soybean meal. These properties were determined by running preheat tests and distance-pressure characteristics on the Rossi-Peakes flow tester.[3]

Peakes[4,5,6] has described a method for running preheat tests on thermosetting molding materials with the Rossi-Peakes flow tester (see diagram on page 58 of the December, 1940 issue of MODERN PLASTICS). His preheat curves for a phenolic type molding material show that a given sample will have a certain flow if allowed to start flowing without any preheating period but if another tablet of the same sample is preheated under pressure for 10 or 20 sec., the total distance of flow is sometimes increased by as much as 15 to 20 percent. For other materials, the distance may be unchanged or may decrease. After a certain initial period of preheating, the amount of flow obtained from successive tablets decreases very rapidly as the time of preheating increases. Finally, if a material is preheated long enough, it will set up completely and will not flow at all.

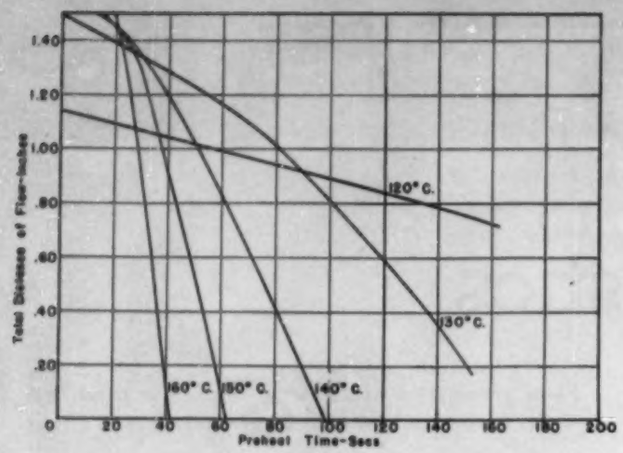
Peakes[4,5] obtained pressure characteristics by determining the distance of flow for samples using several pressures and plotting curves of flow distance versus pressure used. A great deal of variation was found for different samples of phenolic powders. The curves showed a resemblance to the characteristic rate-of-flow/shearing-pressure curves which are such an important part of plasticity studies on pastes, clays, paints and like materials. It was sometimes found possible to translate such curves into a straight portion, indicating a yield pressure and the rate of response to pressure, and a curved transition portion which traces the behavior of the material at pressures in the vicinity of the yield pressure. In a study of such curves made from distance-pressure data, it was possible in some cases to distinguish a rather definite yield pressure; in other cases, it was possible to plot a straight line on logarithmic paper; in others, no rational behavior seemed indicated.

Samples studied

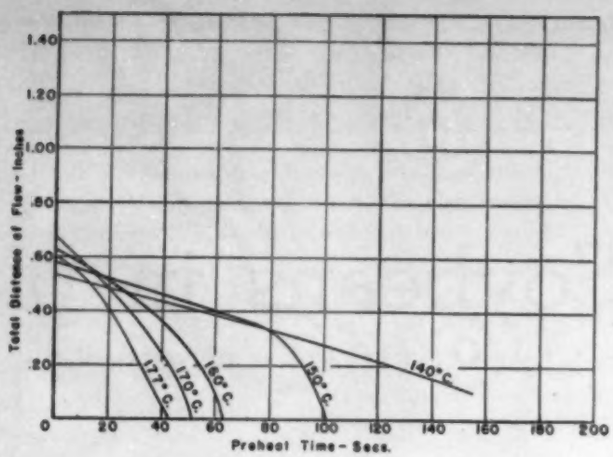
The sample designated as 50-50 was made up of 50 percent phenolic resin and 50 percent wood flour. Its properties are similar to many of the commercial phenolic molding materials. Sample WF 60-40 was made of 60 percent wood flour and 40 percent phenolic resin, and its properties may be compared with those of sample SB 60-40 which was made up with 60 percent for-

* U. S. Regional Soybean Industrial Products Laboratory, Urbana, Illinois, a cooperative organization participated in by the Bureaus of Agricultural Chemistry and Engineering and Plant Industry of the U. S. Department of Agriculture, and the Agricultural Experiment Stations of the North Central States of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
** Now associated with the Western Regional Research Laboratory, U. S. Department of Agriculture, Albany, Calif.

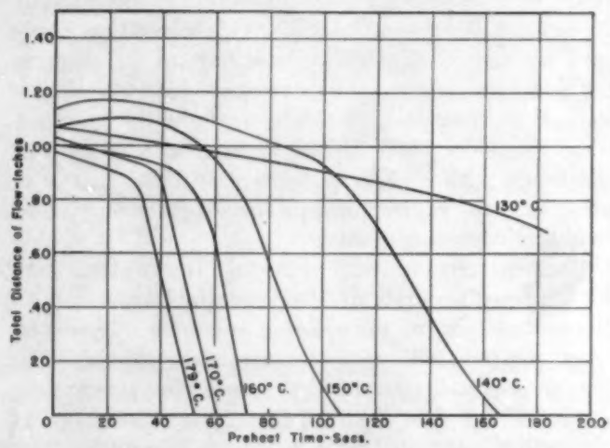
[1] G. H. Brother and L. L. McKinney, Plastics *4*, 93–5 (1940).
[2] G. H. Brother and L. L. McKinney, Ind. Eng. Chem. *32*, 1003–06 (1940).
[3] G. L. Peakes, Plastic Products *10*, 53–7 (1934).
[4] Ibid. *10*, 93–8 (1934).
[5] Ibid. *10*, 133–6 (1934).
[6] G. L. Peakes, MODERN PLASTICS *14*, 39–41 (1937).



1—Effect of temperature on preheat curve of sample 50-50 (50 percent phenolic resin, 50 percent woodflour)



2—Effect of temperature on preheat curve of sample WF 60-40 (60 percent woodflour, 40 percent phenolic resin)



3—Effect of temperature on preheat curve of sample SB 60-40 (60 percent soybean meal, 40 percent phenolic resin)

maldehyde-hardened soybean meal and 40 percent phenolic resin. The hardened meal was washed well with water to remove most of the water-soluble substances such as sugars because it had been found that they lower the water resistance. Sample 333 was made of equal parts of phenolic resin, hardened soybean meal, and wood flour, and sample 332 was made of three parts of phenolic resin, three parts hardened soybean meal, and two parts wood flour. Both of these samples have been tested by industrial concerns and have been found to have molding properties comparable to those of the phenolic wood-flour-filled molding powders on the market. Their flexural strength varied from 7000 to 8000 lb. per square inch.

In each of the foregoing samples a two-stage phenolic resin was used to which 10 percent of hexamethylenetetramine was added to effect complete cure. Two percent of lime based on the resin weight was used as a catalyst. Two percent of calcium stearate based on the total weight of the final composition was used as a lubricant. All samples were mixed in a ball mill for 20 hours and worked on calender rolls for 3 minutes, the hot roll at 210 deg. F. and the cold roll at 160 deg. F. Samples containing hardened soybean meal were rather stiff when first placed on the rolls but became more plastic when the resin worked into the protein.

Preheat tests

Test pellets were formed in a tablet machine. The amount of material used was adjusted so that each pellet had a molded height of 0.266(±0.005) inch. The pressure used for all tests was 1000 lbs. per square inch. Several temperatures were used for each sample tested.

Preheat tests were run on the Rossi-Peakes flow tester as follows: A tablet of the test material was inserted in the closed chamber at the desired temperature. Pressure was applied immediately to consolidate the tablet, but no material was able to flow up the tube because the preheat slide was in place. At any desired time less than that necessary to cure the material completely, the preheat slide was quickly withdrawn, and the hot material flowed up the $^1/_8$-inch tube in the cone until it stopped its own flow by hardening. The test was repeated a number of times, each time increasing the preheat time usually in multiples of 10 sec., until the amount of flow became approximately 0.10 inch.

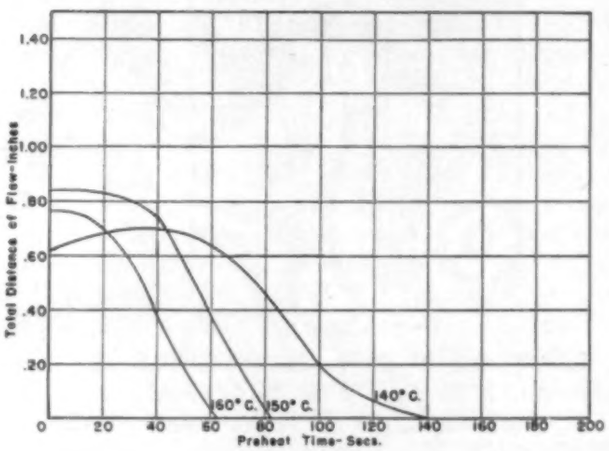
The preheat and flow data are plotted in Figs. 1 to 5. It may be seen that most of the curves, after an initial lag, run steeply down to an intercept on the time axis at zero flow. This intercept is generally called the "setting time." The initial lag indicates the length of time it would be practical to preheat a pellet of this size to obtain a short molding cycle.

If a material is allowed to flow with heat and pressure, a soft material will flow more easily and more rapidly than a hard material. It spreads against the hot mold surfaces more quickly and appears to set faster. It should be noted, however, that in the preheat test all samples are reacted just to full set at equal thickness or size, and that softness is not a factor since the setting time corresponds to zero flow. As a consequence, the usual effect of flow on heating rate and, through it, on

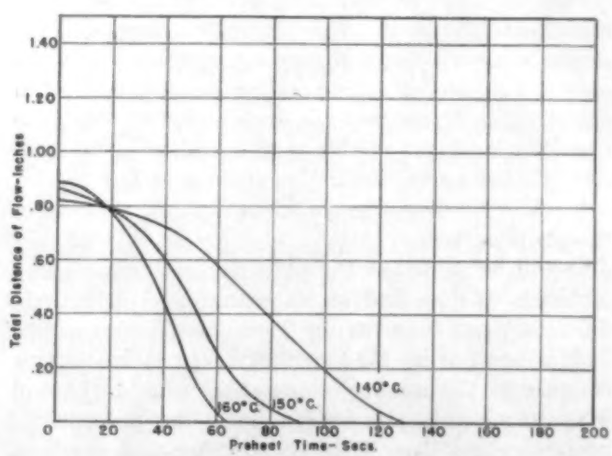
apparent setting rate is eliminated. However, the factor of heat conductivity is still apparent. For example, an asbestos-filled material may set faster because its heat conductivity is higher than that of wood flour.

By comparing the sets of curves given in Figs. 1 and 2, the effect of increasing the wood flour content or decreasing the resin content is obvious. The results in Fig. 2 show that when 40 percent resin is used instead of 50 percent the plastic flow is materially reduced, and the setting time is increased.

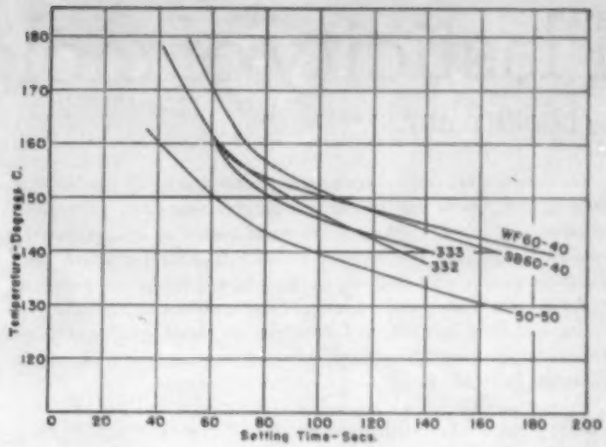
By comparing Figs. 2 and 3, it may be seen that the 60-40 mixture of soybean meal and resin has more flow than the 60-40 mixture of wood flour and resin, thus substantiating other data[1, 2] that the hardened meal has flow properties when plasticized with the uncured phenolic resin. It is also noted that the soybean meal mixture is slightly slower in setting up at all temperatures used except at 140 deg. C. From the standpoint of heat conductivity, the soybean meal plastic would be expected to cure more rapidly than the wood-flour-filled material. It would seem that the acid character of the protein present in the hardened meal has the effect of slowing down the cure of the resin. It is hoped that further research will remedy this condition.



4—Effect of temperature on preheat curve of sample 333 (equal parts of soybean meal, phenolic resin, and woodflour)



5—Effect of temperature on preheat curve of sample 332 (3 parts soybean meal, 3 parts phenolic resin, and 2 parts woodflour)



6—Temperature-setting time curves, showing effect of adding hardened soybean meal to phenolic type molding material

A plastic made up of only soybean meal and phenolic resin is too brittle, and it has been found necessary to incorporate a fibrous filler, such as wood flour, to improve the impact strength. Samples 333 and 332 have wood flour added. By comparing Figs. 4 and 5 with the other figures, it is seen that the preheat properties are comparable and that these samples cure faster than that represented in Fig. 3 in which no wood flour is used. Since leached soybean meal contains about 50 percent protein and 50 percent non-resinous or filler material, it might be expected that a material containing equal parts of resin, soybean meal, and wood flour, as in sample 333, would have flow properties comparable to a 50-50 resin-wood-flour mixture, but such is not the case as may be observed from Figs. 1 and 4. This is probably because plasticized protein is stiffer than the resin.

Setting time

"Setting time" may be defined as the time in seconds required at a fixed temperature and pressure to increase the rigidity just to the point where a compound will no longer flow under that pressure. Temperature-setting time data taken from preheat data at 1000 lbs. pressure per square inch are recorded in Table I. These results are shown graphically in Fig. 6 in which the effect of temperature on setting time (*Please turn to page 106*)

TABLE I. TEMPERATURE-SETTING TIME DATA FOR MOLDING COMPOSITIONS CONTAINING VARIOUS PROPORTIONS OF SOYBEAN MEAL, PHENOLIC RESIN, AND WOODFLOUR

Temp.,	Setting Time, Sec.				
Deg C.	WF 50-50	WF 60-40	SB 60-40	333	332
120	> 180				
130	165 ± 5		> 180		
140	98	185 ± 5	166	140	130
150	62	102	106	82	90
160	41	62	72	62	63
170		51	61		
177		43			
179			52		

Plasticity of molding compounds*

by ROBERT BURNS**

The need of a relatively simple device for measuring the plasticity of molding compounds has been recognized for some time. For those consumers of plastics who require some means of controlling the moldability of their compounds, a device is described which constitutes a simple and inexpensive supplement to the more precise methods. Data are given on a variety of compounds, both thermosetting and thermoplastic, and the effects on plasticity of such variables as moisture content of the powder, temperature, and pressure are discussed in detail.

THE use of capillaries and orifices for measuring plasticity of molding compounds dates back many years. The Bakelite Rossi-Peakes capillary device is familiar in the trade, and an orifice apparatus was used at the Chicago plant of the Western Electric Co. at least fifteen years ago. Although circular capillaries are generally used, variously shaped orifices have been tried to simulate some particular phase of molding, such as the rectangular orifice for the study of gating in injection molding. It is obvious that such devices have contributed substantially to the progress of the plastics art.

Taking advantage of the knowledge gained through these pioneering efforts, the author has devised a plasticity die which is proposed as a relatively inexpensive supplement to existing methods. A description of the device with a discussion of the necessary operating technique and data illustrating its performance follow.

This apparatus, shown in Fig. 1, is essentially a $2^1/_2$-in. disk mold with capillaries of varying size extending downward from the disk. The capillaries are seven in number, the smallest, No. 7, being .015 in. in diameter and the largest, No. 1, .093 in. The split in the cone cuts each capillary exactly in half. The capillaries are 2 in. in length and are provided with an overflow cup for the measurement of very soft materials or for unusual molding technique involving high temperatures or pressures. The die gives a measure of plasticity which may be expressed numerically and produces a molded part for qualitative examination. It is not uncommon to find a material entirely satisfactory from a flow standpoint but unusable due to other defects as disclosed by a visual inspection of a molded specimen.

The testing technique for a thermosetting material is as follows:

The die, together with the plunger placed beside it, is heated between the press platens until the thermometer in the die shows a constant temperature of 300 deg. F. The upper platen is raised, 25 grams of molding powder is poured into the die, the plunger inserted and the press closed with a force of 4 tons ± .1 ton. This produces a pressure of approximately 1 ton per sq. in. The pressure should be applied promptly so that the figure of 4 tons is obtained within 20 sec. after filling the die. This pressure is maintained for 5 min. The specimen may be withdrawn hot. The end of each extruded rod of the specimen is tapped lightly with a pencil to remove any unmolded granules and the length of each rod is measured to the nearest .01 in. In order to express the plasticity of a thermosetting material as a simple arbitrary number for comparative purposes, the length of each rod is multiplied by the number of the capillary from which it was taken. The sum of the seven products is taken as the "plasticity index" of the material.

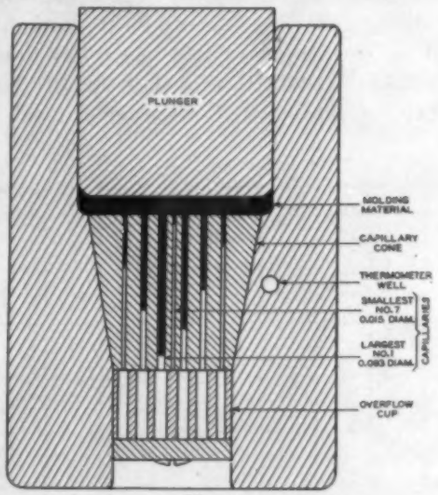


Fig. 1

In the case of thermoplastic materials, the test procedure is the same with the following exceptions:

1. The temperature of the die must be adapted to the plastic properties of the material under test and must be less than that temperature which permits a complete filling of all the capillaries. The test is repeated three or more times at a series of temperatures below this level. The plasticity indices obtained as above described for thermosetting compounds, are plotted against the corresponding temperatures as in Fig. 4. The temperature on such a plot at which the plasticity index has a value of 20 is arbitrarily taken as the "plasticity temperature" of the material.

2. The die should be cooled to facilitate removal of the plastic specimen.

It will be seen that the plasticity of thermosetting materials as described above is expressed in entirely different terms from that of thermoplastic compounds. This is justified by the fact that in the thermosetting compounds the quality which one wishes to control in practice is a complex combination of its thermoplastic properties and the rate of its thermosetting reaction. By contrast, in the thermoplastic materials the purely plastic phenomenon is involved. In view of the fact that these tests are produced as empirical controls

* Presented at the 43rd Annual Meeting of the American Society for Testing Materials, June 24, 1940 and published here by permission of that Society.
** Member of the Technical Staff, Bell Telephone Laboratories, Inc.

TABLE I. REPRODUCIBILITY OF TEST RESULTS

1. All day run on a wood flour filled phenolic—one batch—30-ton self-contained press—27 shots	average	24.1	Max.	26.7	Min.	20.8
2. Same as above except press was hand pumped		24.3		28.1		19.0
3. Nine day-to-day tests on wood flour filled phenolic of different batches—30-ton self-contained press—each day's value an average of at least 5 shots	average of averages	24.6	Max. Avg.	25.7	Min. Avg.	23.5
4. Five day-to-day tests on wood flour phenolic of different batches—100-ton hand-pumped press—each value an average of at least 5 shots	average of averages	25.2	Max. Avg.	27.7	Min. Avg.	22.9
5. Five consecutive day-to-day runs on cotton flock—wood flour filled phenolic—same batch—30-ton self-contained press—each value an average of at least 5 shots	average of averages	18.44	Max. Avg.	19.00	Min. Avg.	18.00
6. All-day run on cellulose acetate—100-ton hand press—9 shots	average	27.4	Max.	31.9	Min.	23.3
7. All-day run on cellulose acetate—30-ton self-contained press—9 shots		26.5		28.1		25.7
8. Same as above except press was hand pumped—9 shots		26.9		29.8		24.1
9. Four day-to-day tests on cellulose acetate—100-ton hand press—each value an average of at least 4 shots	average of averages	25.2	Max. Avg.	27.4	Min. Avg.	24.2

rather than to secure data for theoretical treatment, they must be judged by their practical utility rather than concordance to theoretical considerations of consistence. From a practical standpoint, the discrepancy is not serious. In the case of a thermoplastic compound whose general flow properties are known to the technician, a stipulated test temperature (as prescribed for the thermosetting materials) can be used. For example, in acceptance tests on successive batches of a given material it is entirely feasible to require that when tested at the stipulated temperature the plasticity index shall fall between prescribed limits.

The plastic art is still far from reaching a state at which a particular form of plasticity device can be adopted for universal use. The plasticity test herein discussed appears to possess a combination of features which should make it attractive to those who are concerned with the control of molding procedures. These features are:

1. The employment of seven capillaries of a range of diameters aids in predicting the flow of plastics in various parts of molds of complicated shape more accurately than is possible by flow through a single orifice.
2. Visual inspection of the molded part resulting from the test permits a qualitative observation of the inherent tendency of the material to produce a particular type of defect.
3. The scoring system proposed emphasizes the flow of material through narrow channels and consequently its adaptability to fill inaccessible parts of a commercial mold. This is accomplished by multiplying the length of the rod by the number of the capillary, the capillaries being numbered in inverse order of their diameters.
4. The device can be used for both thermosetting and thermoplastic materials, though the plastic values are expressed in different terms.
5. No observation of time is necessary in the testing of thermoplastics.
6. The plunger is the only moving part.
7. The die can be built for $300 or less.

(*Please turn to next page*)

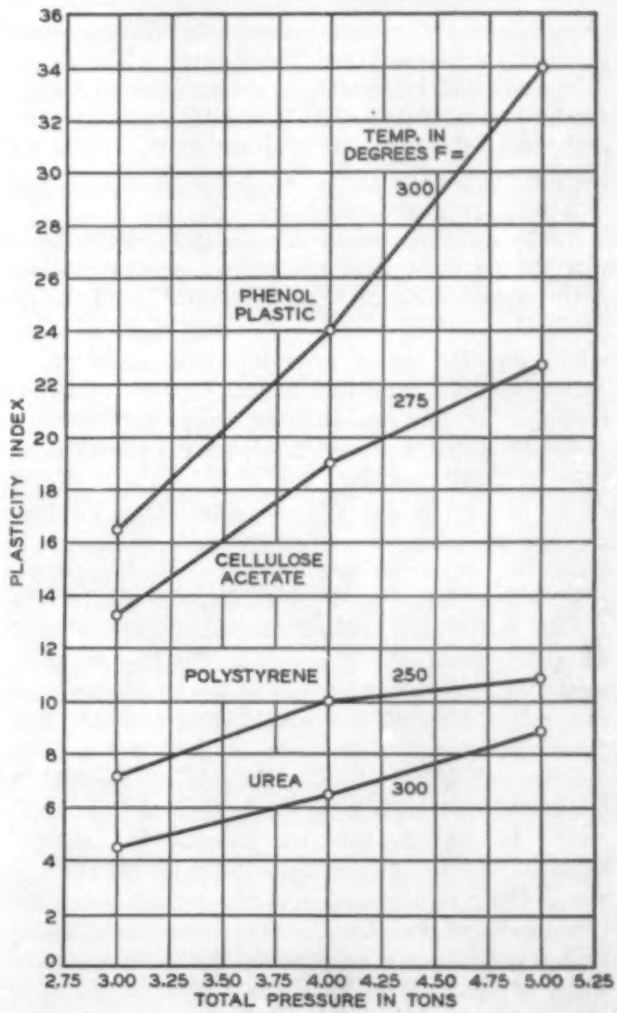


Fig. 2

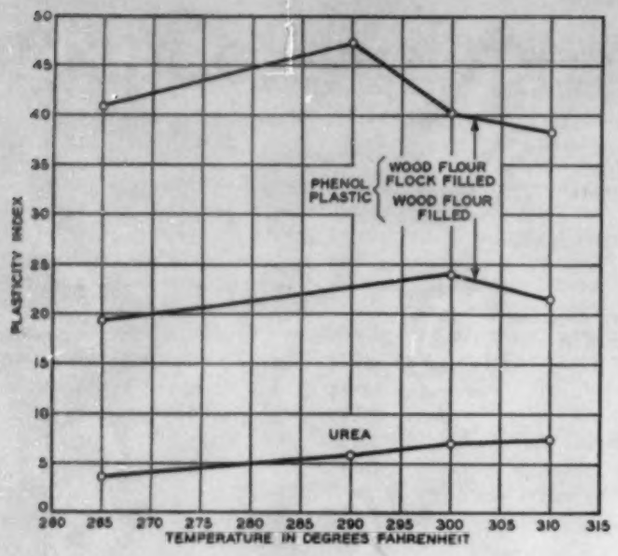


Fig. 3

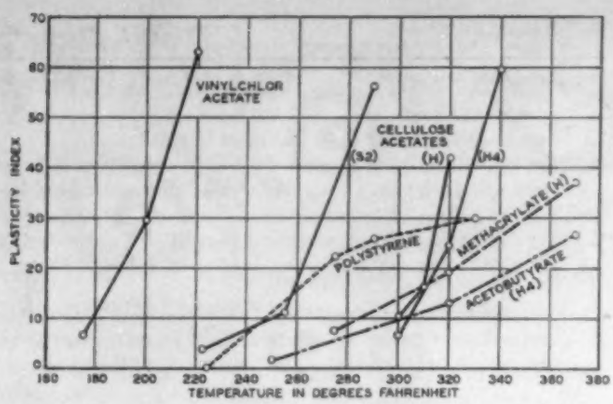


Fig. 4

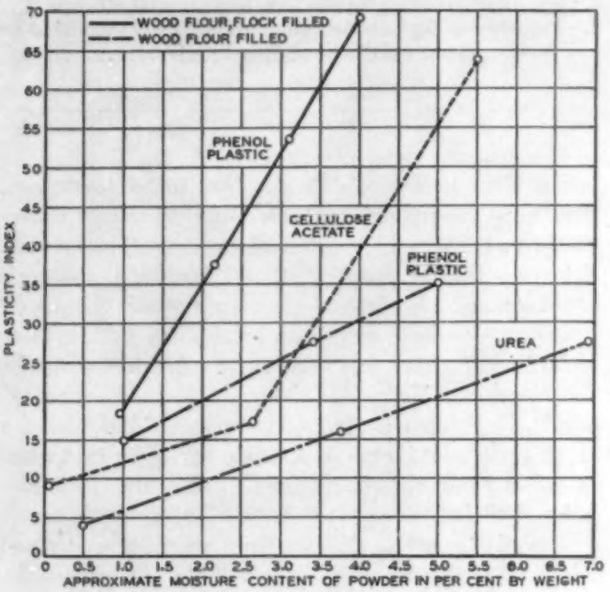


Fig. 5

The question which always arises in any discussion of a test method, especially where standardization between laboratories and between similar testing devices is concerned, is that of reproducibility. In this device, where there are no moving parts other than the plunger, the two variables (assuming identical compounds) are pressure and temperature. The degree of reproducibility therefore is almost entirely a function of how well these variables are controlled. This is shown by the difference in reproducibility where the measurements are made on a self-contained press and on a hand-operated press.

In the practical use of this die it has been found that the maintaining and measurement of the stipulated pressure constitutes the greatest difficulty in reproducing previous results on the same press, or in the interchangeable use of several presses, assuming, of course, that the capillaries are not in some abnormal condition at the steel-molding compound interface. It can be stated, however, that with any low-capacity press in good condition, and an accurate gage, the degree of reproducibility is adequate. Data illustrating the reproducibility of test results are given in Table I.

In any capillary or orifice device, the condition of the die at the steel-molding compound interface is always of importance. This also applies to commercial molds, and unusual conditions at the interface are occasionally designated in the molding trade by the term "mold poisoning." The term is generally used to describe any unique effect on the molding characteristics of a given compound by the interior surfaces of the mold. In changing from one phenolic, for example, to another with a different resin-filler ratio, the effect on the molding characteristics of the second compound is naturally slight. On the other hand, in changing from a phenolic to a cellulose acetate molding composition which involves an entirely different group of ingredients the effect may be marked. In plasticity work it is sometimes necessary to make several moldings of a new material before the influence of the material previously molded in the die is entirely erased. Experience with the multi-capillary die has shown that, just as in commercial molding, the die, if in continuous use, need not be cleaned or polished except on rare occasions. It should receive the same general care as any other mold, and for periods of idleness should be oiled in the usual manner to prevent rusting.

In the use of this method, while it is relatively simple to control temperature, the problem of maintaining a stipulated pressure within the necessarily narrow limits is more difficult, especially when working with thermoplastic materials for which close control of pressure should be maintained during the whole heating and cooling cycle. The use of high-capacity hand-operated presses with large ram diameters, in which small variations in line pressure result in large variations in total force, may yield unsatisfactory results. In Fig. 2 is shown the effect of pressure on the plasticity indices of a phenolic, two thermoplastic materials, and a urea compound. In Fig. 3 is given the effect of temperature on some thermosetting compounds, and in Fig. 4 its effect on typical thermoplastics. (*Please turn to page 104*)

Plastics at A.C.S. meeting

THE papers on plastics presented as part of the program of the Division of Paint, Varnish, and Plastics Chemistry of the American Chemical Society at the meeting in St. Louis on April 7 to 11 were exceptionally interesting and diversified in nature. Five of the papers constituted a symposium on phenolic resins arranged by Dr. S. L. Bass. One of the general papers pertained to linear polymers of the polyester type and another related to the determination of the structure of polystyrene. Two of the papers emphasized the important role which synthetic resins have assumed in the protective coating field. Three papers describing recent development in this country of resins for ion-exchange applications were on the programs of other divisions of the Society.

Titles, authors, and abstracts of these papers on plastics are presented herewith.

Symposium on phenol-formaldehyde resins and plastics

SYNTHETIC PHENOLS FOR RESIN MANUFACTURE. E. C. Britton, Dow Chemical Co.

In recent years several phenols have been manufactured by synthetic processes and have found their place in the phenol-resin industry, especially in the varnish resin field. Among these are *p-tert*-butylphenol, *p-tert*-amylphenol, *p-tert*-octylphenol, *p*-phenylphenol, and *p,p'*-dihydroxydiphenylpropane.

Of the phenols above named, *p*-phenylphenol is the only one not derived from phenol itself. Hence, the availability of phenol is the prime consideration in their future expansion. At the present time, and so far as can be foreseen, sufficient benzene is available for the synthesis of phenol and no shortage is likely even if present production were doubled. Larger production of phenol from chlorobenzene and caustic soda demands new production of chlorine and caustic soda. This synthesis is interesting from the economic standpoint, for it involves only electric power, salt, benzene, and fuel as primary raw materials. The salt is reused in the chlorine cells, only a small make-up being necessary due to loss. In the sulfonation process the raw materials are sulfuric acid, benzene, fuel, and caustic soda. None of the reaction products can be reused in the synthesis. Recently the Raschig process has been developed and this demands chlorine, benzene, and fuel. The chlorine for the process is furnished by a modified Deacon process from the hydrogen chloride of the reaction, only small make-up being necessary. Considerations of expansion of this process must await the trial of the present plant. The other raw materials for the substituted phenols named above are all petroleum products, and no lack should be forthcoming in the immediate future.

p-Phenylphenol from diphenyl sulfonic acid goes back to benzene for its source and can be produced in adequate amount. Other phenols for which processes have been well developed are *p*-cyclohexylphenol from cyclohexene and phenol, *p*-cuminyl phenol from alpha-methyl styrene and phenol, *p*-sec-butylphenol from *n*-butylene and phenol, *m*-phenylphenol from hydrolysis of ortho- or para-chlorodiphenyl, dialkyl phenols from hydrolysis of dialkyl chlorobenzenes, *p,p'*-dihydroxy diphenyl butane or pentane, and *p*-benzyl phenol from benzyl chloride and phenol. The synthetic possibilities are known to the chemist and practically any type of phenol necessary can be manufactured.

THE INFLUENCE OF SUBSTITUENTS ON THE PROPERTIES OF OIL-SOLUBLE PHENOLIC RESINS. V. H. Turkington and Ivey Allen, Jr., Bakelite Corp.

There are hundreds of known or possible phenolic compounds which are capable of reacting with formaldehyde to form resins, many of these being soluble in fatty oils. As these phenolic compounds vary widely in properties, so also do the resins and the oleoresinous varnishes made from them. A representative list of phenolic compounds, substituted in various positions with alkyl, aryl, carboxyl, hydroxyl, or methoxyl groups, has been tabulated, together with a comparison of the properties of their formaldehyde condensation products. Particular emphasis has been placed upon their relative effects when combined with drying oils, for use in oleoresinous coating materials. Such important properties as oil solubility, oil reactivity, color stability, durability, drying rate, and resistance to moisture and alkali have been shown to be closely related to the structure and position of the substituent groups in the phenolic material used in producing the resin.

PLASTICITY DETERMINATION OF PHENOL-FORMALDEHYDE RESINS AND MOLDING POWDERS. L. M. Debing and S. Silberkrause, Monsanto Chemical Co.

A brief description of the principal methods used in this country for determining the plasticity of phenolic molding powders is presented. Typical one-stage and two-stage resins are compounded with and without various standard fillers to illustrate the inadequacy of any one method to classify properly these materials as to plasticity. The factors to be considered in the plasticity determination are discussed on the basis of experimental data presented. The complexities of this problem are such that empirical test methods appear to be the only practical methods available. Standardization of one method would be desirable, but no one test method appears to be adequate.

PHENOLIC RESINS FOR PLYWOOD. L. Klein, The Resinous Products & Chemical Co.

The historical development of phenolic resins for use in plywood is traced for the period from 1907 to the present day. There is a brief description of the various physical forms in which the resin has been used as a plywood adhesive, i.e., as a powder, in organic and aqueous solution, as a dispersion, and finally in film form. New products, water-soluble phenolic powders of good stability, and rapid curing properties are discussed. Development work covering the use of phenolic resins as impregnants to produce products such as "improved wood" and wood with better dimensional stability is covered. The fields of application for resin-bonded plywood are discussed with special emphasis on aircraft construction.

COTTONSEED HULLS IN PHENOLIC PLASTICS. Fritz Rosenthal, University of Tennessee.

Cottonseed hulls have been suggested as fillers in phenolic molding compositions, but very little information has been available heretofore regarding the preparation of the hulls for this application and the properties they lend to the plastic material. Hurst prepared a compound of low resin content based on the low absorbing power of cottonseed hulls. Our work has revealed that the absorbing power is a function of the particle size and of the hull fiber content of the cottonseed hulls.

Cottonseed hulls are a heterogeneous mixture of hull bran and

hull fiber, and the content of the latter may be controlled. Since hull fiber differs chemically and physically from hull bran, it was anticipated that the fiber content of hulls, when used as a filler, should have an influence on the characteristics of the resulting compound. Hull bran samples were prepared of controlled particle sizes of 40, 60, 100, 150, 200, and finer than 200-mesh screen, respectively. Compounds were prepared by impregnating each of these hull bran samples with the same amount of identical phenolic resin. Likewise, compounds were prepared from hull bran of various particle sizes containing 5, 10, 15, and 20 per cent hull fiber, respectively. The thirty compounds thus obtained were tested for impact strength, modulus of rupture, and modulus of elasticity. The test results indicate the influence of particle size and fiber content of cottonseed hulls on the strength characteristics of phenolic compounds.

General Papers

METHODS OF MOLECULAR WEIGHT DETERMINATION FOR LINEAR POLYMERS. SELF-POLYESTERS OF ω-HYDROXY UNDECANOIC ACID. W. O. Baker, C. S. Fuller, and J. H. Heiss, Jr., Bell Telephone Laboratories.

Acceptance of the concept of primary valence linked macromolecules, as chains or networks, has advanced understanding of the properties of plastics. However, if large molecules are the discrete units of polymers, fundamental knowledge of their size and shape is requisite for evaluation of properties. Molecular weight determinations, unlike fine structure studies, generally require observation of a kinetic process or a chemical reaction. Viscosity, solubility, and end-group determination have been selected for comparative studies on identical compounds.

A polymer-homologous series of fourteen of the self-polyesters of ω-OH undecanoic acid was prepared so that compounds of accurately known structure containing their natural distribution of molecular weights could be studied, with average molecular size as the only variable. Further, each of these polymer molecules has a single carboxyl end-group, so that titration yielded an exact number average molecular weight. These volumes were correlated with weight average results from the three rapid and practical kinetic methods of solubility, solution viscosity, and melt viscosity.

Satisfactory agreement among the results from any given three of the four independent methods supports the use of molecular weight studies in characterizing linear polymers. A detailed investigation of the concentration dependence of solution viscosity shows that the Staudinger "reduced viscosity" $\eta sp/c$ (ηsp = specific viscosity, c = concentration) is not concentration independent. The use of a form $\eta sp = ac^3e^{bM}$, where a and b are constants for a series of constant structure, is feasible.

The Arrhenius form for solution viscosity, $\ln \frac{\eta}{\eta_0}$, provides a satisfactory theoretical basis for concentration dependence. Changes in molecular distribution are not sensitively reflected in the solution viscosity.

Further evidence for the segment theory of the kinetic behavior of polymer chains is presented, in agreement with previous solid state studies, and current theoretical proposals.

THE PAINTING OF MAGNESIUM ALLOYS. Robert I. Wray, Aluminum Co. of America.

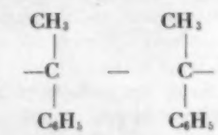
The increasing use of magnesium alloys in numerous industrial fields, especially the aircraft industry, has focused attention on this ultra-light metal. For most of these applications there is need for serviceable protective coatings. In order to evaluate different protective coatings, the use of a special accelerated test was resorted to, which comprised cycles of alternate immersion in synthetic sea water combined with outdoor weathering at an angle of 45 deg to the vertical facing south. Paint performance was found to be directly affected by the resistance to corrosion of the various magnesium alloys. The composition of the alloys determines, in large measure, their resistance to corrosion. As in the case of other metals, adequate surface treatment prior to painting was found to be very important. Numerous methods of surface treatment were investigated but the best protection was obtained with the "chrome pickle" treatment followed by a sealing treatment in hot dichromate solution or by means of a short dip in hydrofluoric acid followed by a sealing treatment in hot dichromate solution.

Zinc chromate primers made with phenolic resin varnishes of moderate oil length showed outstanding performance, particularly when followed by three coats of aluminum paint made with the same vehicle. It was found necessary to employ three finishing coats over the primer to achieve adequate protection under severe service conditions. Phenolic resin varnishes of 20 to 25 gallons oil length proved better than longer oil varnishes.

The order of failure of the various coatings in the alternate immersion test was found to agree quite well with that obtained in atmospheric exposure at the seacoast, although failure occurred at a much more rapid rate in the accelerated test. In certain instances the ratio of time of failure in the two types of exposure was as great as 1:50. In industrial atmospheric tests it has not been uncommon to obtain satisfactory protection for five or six years. By proper selection of alloys, surface treatment, and painting system it has been found possible to obtain satisfactory protection on magnesium alloys for several years, even under relatively severe service conditions.

STRUCTURE OF VINYL COMPOUNDS. I. POLYSTYRENE. E. L. Kropa and R. Bowling Barnes, American Cyanamid Corp.

The infra-red spectra of monomeric and various polymeric styrene fractions have been determined. The spectra indicate that during the polymerization of styrene, double bonds disappear and methyl groups appear. The structure of polystyrene, as deduced from present experiments, indicates that the styrene residues are linked in a manner as follows:



Using the methyl formula for styrene, it is possible to correlate certain molecular weight data obtained by the viscometric method with molecular weights which are deduced from ultracentrifugal procedure.

SYNTHETIC RESINS AS EXCHANGE ADSORBENTS. R. J. Myers, J. W. Eastes, H. C. Cheetham, and F. J. Myers, Resinous Products and Chemical Co.

The recent development of synthetic resins which exhibit ion-exchange properties has opened a new field of application which promises unique uses in the purification of water and other fluids, in the recovery of valuable substances, in the removal of undesirable impurities, and in a multitude of special uses in the solution of problems hitherto thought impractical. Whereas previously the selection of a synthetic resin for a particular application has been based upon physical properties (hardness, solubility, color, etc.) the applications of synthetic resins as ion exchangers focuses attention upon the chemical properties of the resins. Thus, the phenol-aldehyde resins can be prepared to function as cation-exchanges and may be used in the sodium cycle for removal of hardness-producing ions, such as calcium, iron, etc., or may be used in the hydrogen cycle to replace all cations with hydrogen. Again, amine-aldehyde resins may be prepared which function as acid-absorbents, or "anion-exchangers," and which may be used also to recover or remove acid radicals from solutions. (*Please turn to page 102*)

Improved design for injection molds

by LEO D. FELTON

SINCE the introduction of injection molding into the United States, many articles have appeared describing the advantages of certain improvements in the machines, methods and materials used in injection molding. Little has been written during this time regarding the benefits of improvements in mold design and construction. It is possible at times to definitely improve the quality of the product and substantially reduce the cost by slight changes in the design and operation of the mold.

Fig. 1

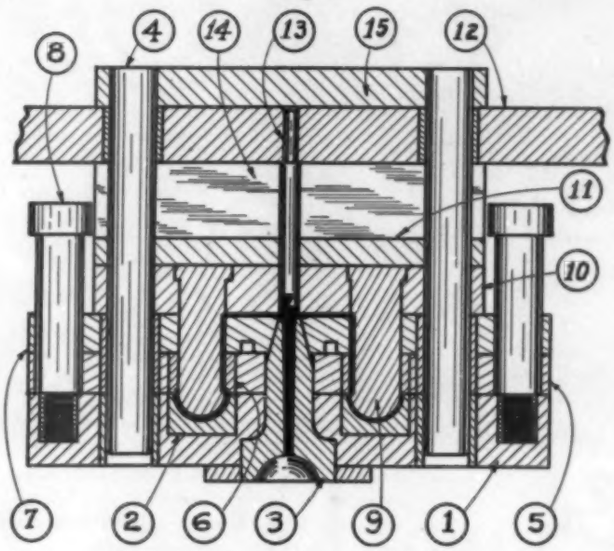
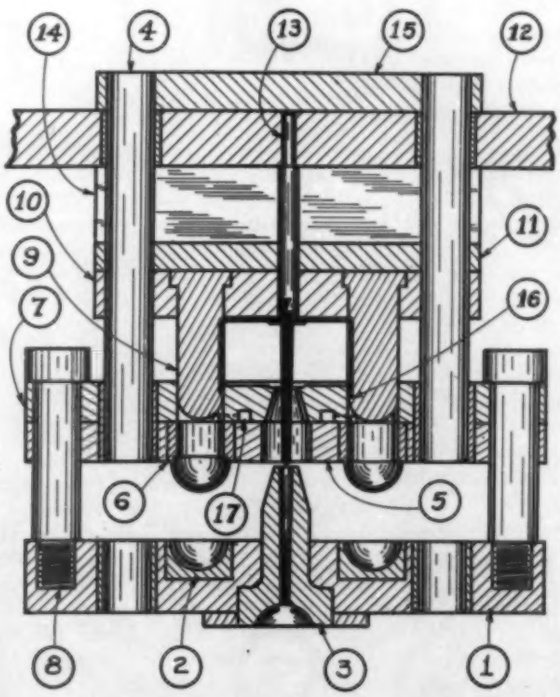
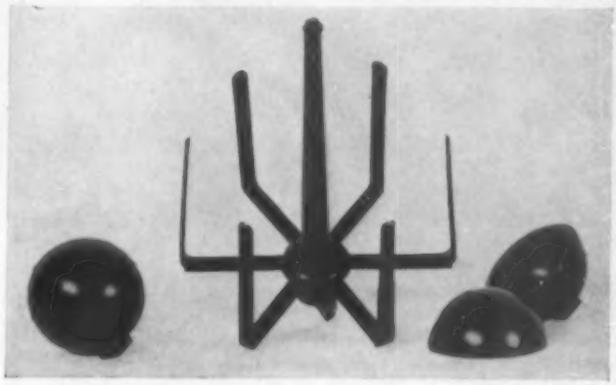


Fig. 2



One of the undesirable features of a piece injection molded in the molds of customary design, is the runner projecting from the edge of the molded piece. The removal of this runner often presents a serious problem to the molder. To merely break the runner from the molded piece will leave a blemished edge, which is undesirable from the appearance viewpoint. Also, if the piece must fit other parts, this blemish may interfere with the mechanical use of the piece, as in the case of a bushing. Often the molded pieces are of such size or form as to make it very difficult to remove this runner by any economical means. To avoid these difficulties the runner may be extended along the side of an elongated mandrel and sheared from the molded piece during the opening of the mold. The pieces then are usually blown from the face of the opened mold. The air enters through the opening formed by the partly withdrawn mandrels.



Assembled molded parts are shown at left, the runner in the center and separate pieces at right. Part at extreme right has a projecting ring to press into the other half of the ball. No additional trim is necessary to make the two parts fit

One of the molds of this design is shown in the accompanying illustrations. Fig. 1 shows the mold in the closed position. Fig. 2 shows the mold in a partly opened position with the runners sheared from the molded shells. It is while the mold is in this position that molded parts are blown from the stripper plate.

The mold shown in Fig. 1 and Fig. 2 is made up of the following parts:

(1) Retaining block with cooling channels
(2) Cavity inserts
(3) Nozzle
(4) Guide pins
(5) Stripper plate
(6) Stripper bushings
(7) Air channel plate
(8) Stripper screws
(9) Grooved mandrels
(10) Mandrel retaining plate
(11) Mandrel support plate
(12) Ejector bar
(13) Ejector pin
(14) Support blocks
(15) End plate

(*Please turn to page 102*)

Plastics digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastics materials or use them. Requests for periodicals mentioned should be directed to the individual publishers.

General

WHAT'S THE PAST, PRESENT, AND FUTURE OF PLASTIC AUTOMOBILE BODIES? H. Chase. Iron Age *147*, 44–8 (Feb. 27, 1941). The experimental work and plans of the Ford Motor Co. are discussed. Molds have been ordered for an experimental body to be made up of about 227 pounds of tubular steel and 155 pounds of plastic panels. Trunk cover panels have been molded of a preformed mixture of resin, wood pulp, and reinforcing fibers, using a 1000-ton press and a three-decker mold. Based on an area of about 1300 sq. in., the pressure per sq. in. was approximately 1600 pounds. This whole program is still well back in a development stage as far as production models are concerned.

MOLDED PLASTIC SCREEN WITH CONTOURED SURFACE. R. O. Walker. J. Soc. Motion Picture Eng. *36*, 202–6 (Feb. 1941). Provided with holes molded in the shape of flaring horns, this seamless screen represents a departure from the conventional. It is molded in sizes up to 30 feet wide. It is reinforced to prevent tearing under impact by bonding it to a cotton fabric. In addition to the advantages of collecting less dirt and providing better sound transmission than ordinary screens, the tiny elliptical and toric contours produce an effect of depth. Technicolor shows the perspective illusion at its best.

PROTECTION OF DOCUMENTS WITH CELLULOSE ACETATE SHEETING. B. W. Scribner. Natl. Bur. of Standards Misc. Pub. M168, 11 pages. Cellulose acetate sheetings were tested for laminating quality, resistance to wear, and stability. Three lamination processes were employed namely: plain sheeting and sheeting with adhesive, both applied with heat and pressure, and sheeting with adhesive, applied by pressure at ordinary temperature. The original stability of the papers was not impaired and no clouding of photographs or distortion of signatures occurred.

Materials and Manufacture

PLASTICS AND POWDER METALLURGY. H. W. Greenwood. Plastics *5*, 51, 59 (Mar. 1941). Possibilities of widening the field of plastics by altering certain properties through the addition of metal powders is discussed. Thus, conductance of heat and electricity and increased hardness open up new applications for plastics in various branches of engineering.

THE INFLUENCE OF SYNTHETIC RUBBERS ON PLASTICS. H. Barron. Chemical Age *44*, 107–9 (Feb. 22, 1941). Production of styrene and acrylic nitrile on a large scale for synthetic rubber means that any excess can be diverted into the plastics industry at low cost. Possibly many other vinyl plastics will come into use and the vinyl butyral resin for safety glass may find its counterpart in some new vinyl plastic for synthetic rubber.

SHELLAC. The following reports have been received from the London Shellac Research Bureau. "Chemical Constants of Lac. Some Notes on the Acid, Saponification, and Hydroxyl Values of Lac," by B. S. Gidvani and J. M. Dobbie, Oct. 1940. "Lac-Cellulose Lacquers," by B. S. Gidvani and R. Bhattacharya, Nov. 1940.

Applications

THE SPECIFICATION OF TRANSPARENT CONTAINERS. Modern Packaging *14*, 29–34 (Apr. 1941). Experimental data on the resistance to crushing of transparent containers and on the moisture transfer, tear resistance, and folding endurance of cellulose acetate sheet as related to thickness are reported.

CONTAINERS AND LACQUERS FOR FOODSTUFFS. F. D. Farrow and T. G. Green. Chem. and Ind. *60*, 95–103 (Feb. 15, 1941). Advantages and disadvantages of food containers made of glass, tinplate, and paper are reviewed. The construction of tin cans to minimize waste is considered. The lacquers applied to these cans include clear and pigmented oleoresinous, phenolic, and vinyl types. Details are given regarding the methods of baking the protective coatings and the conditions of food sterilization which such coatings must withstand. Discussion in Chem. and Ind. *59*, 847 (Dec. 21, 1940).

INSULATING MATERIALS. J. F. Gillies. Elec. Review (London) *128*, 367–8 (Feb. 14, 1941). Recent developments in synthetic products for electrical insulation are described and comparative values are given for the electrical properties of plastics and other insulators.

ECONOMICS OF SUBSTITUTING SYNTHETIC RUBBER IN AUTOMOBILES. W. J. McCortney. S.A.E. Journal *48*, 94–7 (Mar. 1941). Greatly improved resistance to oils, greases, and solvents is the characteristic of synthetic rubbers of greatest interest to the automotive engineer. The aviation industry is by far the greatest user of synthetic rubbers. Brief reviews of the qualities of neoprene, Thiokol, Hycar, Butyl, and Chemigum are presented.

Properties and Testing

INVESTIGATION OF THE IMPACT STRENGTH OF PLASTICS. W. Kuntze, R. Nitsche, and H. V. Mertens. Kunststoffe *30*, 193–9 (July 1940). The effects of weight of the hammer, velocity of the falling pendulum, and size of the specimen on the values obtained for impact strength were investigated.

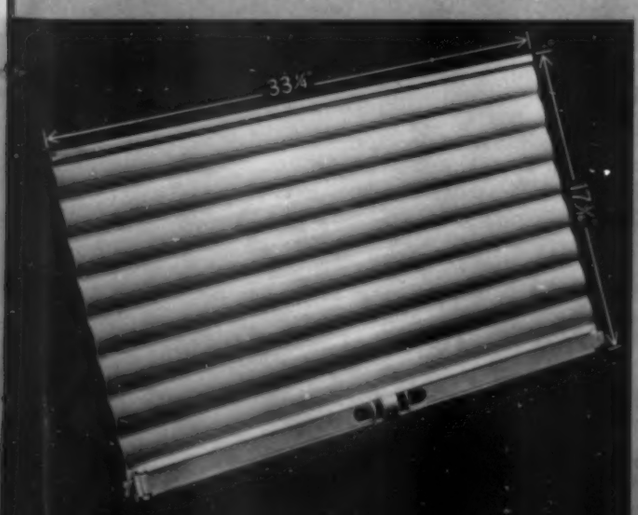
POWER FACTOR MEASUREMENTS AT HIGH FREQUENCY. W. Holzmüller. Kunststoffe *30*, 177–8 (June 1940). Power factors and dielectric constants of polyvinyl acetate, polyvinyl alcohol, polyacrylic acid, and phenol-formaldehyde (novolak) resin were determined at 1,000,000 cycles over the temperature range 20 deg. to 130 deg. C. The power factor increases with rising temperature to a maximum, after which it decreases. The dielectric constant increased continuously within the temperature range investigated.

PREDICTION OF LIGHTING PERFORMANCE OF PLASTIC MOLD DESIGNS BY EXPERIMENTAL MODELS. G. R. Baumgartner. Illum. Eng. *35*, 949–59 (Dec. 1940). Development of a practical method of determining lighting characteristics of designs for molded compound shapes by the use of paper models is reported. Apparatus for measuring transmission and reflectance properties and light distribution for analysis of experimental shapes and finished products is described and illustrated.

BLAST TESTS ON GLASS. Plastics *5*, 23–5 (Feb. 1941). Glass panes were treated with anti-shatter materials, such as textile netting, lacquers, films, tapes, and brown paper. The glass sheet is placed over the opening of a transparent plastic bell jar connected through a valve to a large vacuum reservoir. The valve is opened quickly, subjecting the glass to a sudden strain which breaks it. The number and velocity of the flying fragments were recorded photographically.

A shade larger than most plastic moldings

Bus window shade molded by Eclipse Moulded Products Co. for Greyhound Management Co.



TENITE WINDOW SHADES are among the largest units ever molded of a thermoplastic. They are strong, light in weight, and designed to withstand long, hard service.

The resilience of Tenite and corrugated construction of the molded piece provide flexibility for raising and lowering the shade. A translucent, neutral color is used which admits a soft light and eliminates glare. The smooth, lustrous surface is dirt-resistant and will not become dingy with wear.

Tenite, with its excellent molding properties, dimensional stability, and extreme toughness, is contributing to the development of new and larger thermoplastic moldings. A 28-page book, illustrating and describing some of the many uses of this versatile plastic, will be sent on request.

TENITE REPRESENTATIVES: *New York*, 10 East 40th Street. *Buffalo*, 1508 Rand Building. *Chicago*, 2264 Builders' Building. *Detroit*, 904-5 Stephenson Building. *Leominster, Massachusetts*, 39 Main Street . . . Pacific Coast: Wilson & Geo. Meyer & Company—*San Francisco*, Federal Reserve Building; *Los Angeles*, 2461 Hunter Street; *Seattle*, 1020 4th Avenue, South.

TENNESSEE EASTMAN CORPORATION
Kingsport, Tenn. *Subsidiary of Eastman Kodak Company*

TENITE an Eastman plastic

U. S. plastics patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

CELLULOSE ACETATE PLASTIC. E. A. Rodman (to E. I. du Pont de Nemours and Co.). U. S. 2,231,818, Feb. 11. Plasticizing cellulose acetate with tributyl or triamyl phosphate blended with dimethyl or dimethoxyethyl phthalate and a dipropionate or dibutyrate of diethyleneglycol or triethyleneglycol.

SOUND RECORD. W. Zerweck, K. Keller and P. Pinten (to I. G. Farb. Akt.). U. S. 2,231,836, Feb. 11. Coating paper with a melamine-formaldehyde resin and hot-pressing the product.

VARNISH RESIN. L. C. Swallen (to Monsanto Chemical Co.). U. S. 2,231,860, Feb. 11. Making an oil-soluble resin by condensing phenol first with butyraldehyde and then with formaldehyde.

ARTIFICIAL WOOL. P. Esselmann and J. Düsing (to Walther H. Duisberg). U. S. 2,231,890-1-2, Feb. 18. Animalizing rayon (so that it takes acid dyes just as wool does) by treatment with a resin formed by condensing ethyleneimine or a homolog thereof with an aryl isocyanate or isothiocyanate in presence or absence of a protein and carbon disulphide or a like reagent.

CELLULOSE MOLDINGS. Christopher Luckhaupt. U. S. 2,231,928, Feb. 18. Compounding wood pulp or sawdust with terpin hydrate and molding the product at 115 deg. C. or higher.

ACETATE FOILS. J. H. Rooney and P. R. Hawtin (to Celanese Corp. of America). U. S. 2,232,012, Feb. 18. Extruding an acetone solution of cellulose acetate through a slit into a countercurrent stream of air at about 40 deg. C. to form a thin foil.

INSULATING TAPE. J. K. Webb (to International Standard Electric Corp.). U. S. 2,232,041, Feb. 18. Impregnating a fabric tape or sheet with liquid styrene and polymerizing the styrene at a temperature between 90 deg. and 100 deg. C.

CONTAINERS. I. Gurwick (to Shellmar Products Co.). U. S. 2,232,062, Feb. 18. Forming container units, each made from two sheets of rubber hydrochloride, stacking the units alternately with insulating spacers and heat-sealing the edges of each unit.

PLYWOOD SIDING. Jas. V. Nevin. U. S. 2,232,075, Feb. 18. Weatherproof, verminproof lapboard for outdoor siding on houses is made of three plies of wood bonded with an insoluble, infusible cresol-aldehyde resin.

MOLDING MACHINE CONTROL. W. Ernst and L. S. Hubbert (to Hydraulic Press Corp.). U. S. 2,232,103, Feb. 18. An improved electrically operated flow controller for molding presses.

INJECTION MOLDING. W. Ernst (to Hydraulic Development Corp.). U. S. 2,232,104, Feb. 18. Molding thermoplastics in an injection molding press, first at the injection pressure and finally at a higher pressure to fill out the mold.

SYNTHETIC TEXTILES. A. F. Klein (to American Cyanamid Co.). U. S. 2,232,460, Feb. 18. Union fabrics containing unshrunk vinyl chloride:vinyl acetate interpolymer fibers are dyed in a bath which shrinks the resin fibers.

POLYETHYLENE MOLDINGS. A. Renfrew and J. W. Davison (to Imperial Chemical Industries, Ltd.). U. S. 2,232,475, Feb. 18. Compression molding of polyethylene, first above its melting point and then while cooling in the mold under increasing pressure.

SOLUBLE RESIN. H. W. Arnold and G. L. Dorough (to E. I. du Pont de Nemours and Co.). U. S. 2,232,515, Feb. 18. Interpolymerizing 80 to 96 percent of a lower alkyl methacrylate with 4 to 20 percent of butadiene, isoprene or the like to form a tough moldable resin which is soluble in organic solvents.

FILM FORMER. H. R. Dittmar and R. G. Kennelly (to E. I. du Pont de Nemours and Co.). U. S. 2,232,595, Feb. 18. A coating composition containing a wax-polymer blend made of at least 60% mineral wax and at least 15% of a polymerized methacrylate of an alcohol not lower than propanol.

UREA RESIN. R. A. Jacobson (to E. I. du Pont de Nemours and Co.). U. S. 2,232,609, Feb. 18. Condensing dimethylolurea with an alkyl (methyl to amyl) ester of a hydroxycarboxylic acid (not higher than hydroxycaprylic acid).

SHOTGUN CARTRIDGE. H. A. Roberts and Wm. Dickson. U. S. 2,232,634, Feb. 18. Molding a cartridge shell and base from a waterproof nonflammable plastic and sealing the loaded cartridge with a like plastic.

LAMINATED PRODUCT. D. B. Schwartzman (to Protex Products Co.). U. S. 2,232,640, Feb. 18. Stacking fusible rubber hydrochloride and paper in alternate layers and cutting through the stack with a hot die to fuse the rubber hydrochloride edges together.

MOLDING PRESS. Walter Köhler. U. S. 2,232,644, Feb. 18. A screw press for molding solid or semisolid vinyl or acrylate polymers.

PLYWOOD. Jas. V. Nevin. U. S. 2,232,718, Feb. 25. Bonding wood layers together with a cresol-formaldehyde resin.

SAFETY GLASS. J. D. Ryan (to Libbey-Owens-Ford Glass Co.). U. S. 2,232,806, Feb. 25. As interlayer in safety glass, a polyvinyl acetal resin plasticized with an alkyl ester of adipic acid or of a higher dicarboxylic acid.

CELLULOSE ETHERS. F. C. Peterson and A. J. Barry (to Dow Chemical Co.). U. S. 2,232,926-7, Feb. 25. Making benzylcellulose in a single stage low temperature reaction (below −33 deg. C.); and making polymerizable allylcellulose by the same method.

POLYSTYRENE. Sylvia M. Stoesser and R. D. Lowry (to Dow Chemical Co.). U. S. 2,232,930, Feb. 25. Interpolymerizing styrene with 0.5 to 10 percent of cinnamic acid to form a resin.

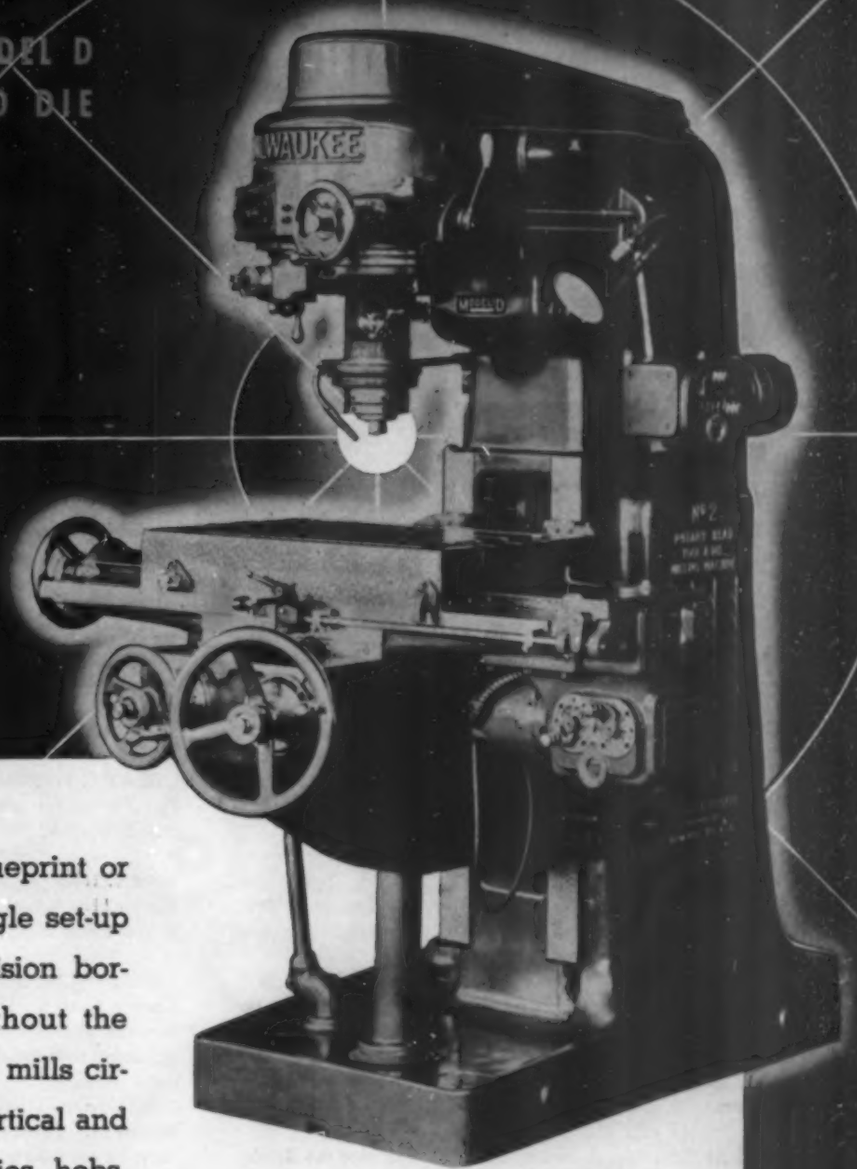
(Please turn to next page)

MAKE PRECISION DIES, HOBS, MOLDS

more rapidly-more accurately

IN A SINGLE SET-UP

WITH THE MILWAUKEE MODEL D ROTARY HEAD TOOL AND DIE MILLING MACHINE



A MACHINE that transmits blueprint or drawing into steel—in a single set-up — layout, milling, drilling, precision boring and slotting operations without the use of models and templates . . . mills circular and angular cuts in both vertical and horizontal planes — completes dies, hobs, molds without resetting of machine and with unprecedented speed and accuracy . . . Send for Bulletin No. 1002 giving full information on the Milwaukee Model D — Rotary Head Tool and Die Milling Machine.

KEARNEY & TRECKER CORPORATION

MILWAUKEE, WISCONSIN, U.S.A.

HEAT-STABLE POLYMERS. R. M. Wiley and J. E. Livak (to Dow Chemical Co.). U. S. 2,232,933, Feb. 25. Plasticizing vinylidene chloride or vinyl chloride resins with aryl-aralkyl ethers or diaralkyl ethers to lower the softening point while increasing toughness and heat resistance.

PRINTING BLANKET. C. E. Wooddell (to Carborundum Co.). U. S. 2,232,989, Feb. 25. Coating a sheet of hard paper with a tough resilient film of a synthetic resin.

ADHESIVE PAPER. Benj. Asnes and E. L. Kallander (to Dennison Mfg. Co.). U. S. 2,233,090, Feb. 25. Gumming paper with a blend of wax, rubber, vinyl resin and a small proportion of chlorinated rubber.

ABRASIVES. R. L. Melton and R. C. Benner; R. L. Melton and G. L. Chapman (to Carborundum Co.). U. S. 2,233,175–6, Feb. 25. In making sandpaper or other abrasive product a thermosetting binder is used and setting is effected by the heat of a high frequency a. c. field.

BEARING. L. T. Frederick (to Richardson Co.). U. S. 2,233,206, Feb. 25. A bearing material comprising laminated permeable synthetic resin composition with graphite dispersed through it.

TRANSPARENT CONTAINER. E. D. Gillam (to Comly, Inc.). U. S. 2,233,207, Feb. 25. Forming a container from a heavy and a light sheet of transparent regenerated cellulose, joined by a transparent adhesive.

FLOAT. Wm. J. Witthaus. U. S. 2,233,235, Feb. 25. A colored plastic float for use in gage glasses.

PLASTICIZING UREA RESINS. D. W. McArthur, T. S. Hodgins and A. G. Hovey (to Reichhold Chemicals, Inc.). U. S. 2,233,320, Feb. 25. Adding latex to aqueous solutions of urea-formaldehyde-ethyleneglycol resins.

INJECTION MOLDING. G. Thilenius (to Eckert & Ziegler G. m. b. H.). U. S. 2,233,354, Feb. 25. An improved mold closing and opening mechanism for injection molding machines.

BLENDED RESIN. E. F. Fiedler (to General Electric Co.). U. S. 2,233,406, Mar. 4. Effecting partial condensation of phenol with excess formaldehyde in alkaline medium and introducing into the system an alkyd resin derived from an aliphatic and an aromatic dicarboxylic acid by esterification with a glycol and a higher polyhydric (at least trihydric) alcohol.

VINYLIDENE CHLORIDE SHEET. R. M. Wiley (to Dow Chemical Co.). U. S. 2,233,442, Mar. 4. Forming vinylidene chloride resin into a sheet in which the molecules have a parallel orientation.

SEMISTIFF COLLAR. F. C. Hilberg (to E. I. du Pont de Nemours and Co.). U. S. 2,233,477, Mar. 4. A collar with a face ply and a back ply, both firmly bonded to an interliner containing thermoplastic resin fibers which soften at ironing temperatures.

AMINE RESIN. A. G. Hovey and T. S. Hodgins (to Reichhold Chemicals, Inc.). U. S. 2,233,531, Mar. 4. Condensing isobutylamine with crotonic acid to form a resin.

WRAPPING FOILS. E. M. Kratz, H. Heckel, E. Browning and E. Gebauer-Fuelnegg; E. M. Kratz (to Marbon Corp.). U. S. 2,233,885; 2,233,891, Mar. 4. Making brilliantly clear, transparent, tough wrapping foils by treating a caseinate with formaldehyde and compounding the product with chlorinated diphenyl and a plasticizer; and incorporating a small proportion of a fatty acid in such foils.

EXTRUSION CHAMBER. V. S. Shaw (to Hydraulic Press Corp.). U. S. 2,233,558, Mar. 4. An extrusion chamber for plastics has a casing and a cylindrical deflector, with means for heating the plastic before it reaches the deflector.

PLYWOOD. J. H. Schmidt and R. T. Casselman (to Union Carbide & Carbon Corp.). U. S. 2,233,875, Mar. 4. Using hydrochloric acid as the hardening agent for setting a phenol-aldehyde resin in bonding plywood layers.

NONGLARE SAFETY GLASS. E. L. Fix (to Pittsburgh Plate Glass Co.). U. S. 2,233,941, Mar. 4. Two glass plates, each faced with a plasticized partial vinyl acetal resin, are joined by an interlayer of hard cellulosic foil containing oriented light-polarizing particles.

PACKAGE. I. Gurwick (to Shellmar Products Co.). U. S. 2,233,945, Mar. 4. Filling a momentarily heat-softened rubber hydrochloride sheet container with material to be packaged and folding the rubber hydrochloride while it is still soft, to seal the package.

DOUBLE WINDOW. S. G. Lipsett (to Robert Mitchell Co., Ltd.). U. S. 2,233,952, Mar. 4. An insulating window with two panes, spaced apart by a marginal cushion of plastic composition in which preformed rubber spacers are embedded at intervals.

STRIPED PLASTICS. C. Orsini (to Nixon Nitration Works). U. S. 2,233,987, Mar. 4. Forming a number of differently colored strips of plastic by extrusion through ducts of colored soluble material, and extruding the strips through a single nozzle.

TEMPLE ROLL. Roger W. Cutler. U. S. 2,233,995, Mar. 4. A ribbed temple roll is made of a vinyl resin or of synthetic rubber with embedded hairs for engagement with fabric acted on by the roll.

TWO-TONE DIE CASTING. D. Marinsky and L. H. Morin (to Whitehall Patents Corp.). U. S. 2,234,185, March 11. Obtaining two-tone die castings by injecting one color of thermoplastic into a mold cavity, transferring it to a larger cavity in the same die and injecting another color of thermoplastic into both cavities.

SLAT COVERS. P. H. Dougherty. U. S. 2,234,399, March 11. Covers for Venetian blind slats are made of a durable non-fibrous flexible, somewhat elastic plasticized film material.

SHAPING PLASTICS. Mario Gallo. U. S. 2,234,432, March 11. A portable machine for making a plastic into wafers by extruding a cylinder of the plastic and slicing it as it emerges.

PHENOLIC RESIN. J. L. Brannon (to Union Carbide and Carbon Corp.). U. S. 2,234,548, March 11. Effecting phenol-formaldehyde resin condensations in presence of tetramethyl-ammonium hydroxide.

HYDROPHOBE RESIN. Karl Loos. U. S. 2,234,569, March 11. Making a machinable infusible phenol-formaldehyde resin by alkaline condensation.

LAMINATED PRODUCT. H. L. Trumbull (to B. F. Goodrich Co.). U. S. 2,234,611, March 11. Superficially chlorinating rubber and adhering gamma-polyvinyl chloride directly to the chlorinated surface.

PLASTICIZER. C. H. Alexander (to B. F. Goodrich Co.). U. S. 2,234,615, March 11. Plasticizing vinyl chloride resins with a tetrahydrofuryl ester or ether.

(*Please turn to next page*)

Plastics ITI Students MAKE MISTAKES INTENTIONALLY

. . . to learn HOW TO MOLD

Intentional mistakes, and a perfect record of how they are made, are important parts of training in molding at Plastics ITI. In this way, students learn to distinguish between poor and perfect moldings, immediately determine the reason for any imperfection, and take the necessary steps to correct it. The accompanying photographs show the permanent record of this method of training.

In injection molding, for example, the cycle begins with too little heat and insufficient time, with the result that the molding is weak and the cavity only partially filled. From this point on, first the temperature, then the time cycle, is increased until a perfect molding is obtained. This process is continued until results of overcure and excessive heat are clearly demonstrated. Each piece is carefully examined by students as it comes from the mold, conditions are noted, time and temperature jotted down. Then it is mounted with this information as a permanent record. All types of thermoplastics are put through these same tests.

Identical procedure is followed in compression molding, using all types and grades of thermosetting materials in manually operated and fully automatic presses.

By learning HOW mistakes are made, students learn to recognize and avoid them in production. This same method of trial and error by actual operation is carried through all phases of training at PLASTICS ITI.

One Year Engineering, Short-term Day or Evening Courses, and Home Study (with or without shop training), are available. Write for illustrated literature.

Francis A. Gudger
President

John Delmonte
Technical Director

Plastics INDUSTRIES TECHNICAL INSTITUTE
182 SOUTH ALVARADO STREET...LOS ANGELES, CALIF.

ADVISORY BOARD

Donald Dew
Diemolding Corp.

Dr. Gordon M. Kline
Nat'l Bureau of Standards

Spencer E. Palmer
Tennessee Eastman Corp.

Louis M. Rossi
Bakelite Corp.

E. F. Lougee
Chairman

COATED METAL. S. L. Brous (to B. F. Goodrich Co.). U. S. 2,234,621, March 11. Adhering vinyl chloride resin to metal by a cementing coat of highly chlorinated rubber.

HYDROCARBON RESINS. C. A. Thomas (to Monsanto Chemical Co.). U. S. 2,234,660, March 11. In polymerizing the unsaturates of cracked petroleum distillates the yield of naphtha-insoluble resin is decreased in favor of naphtha-soluble resin by mild incipient resinification prior to adding a catalyst for the final reaction.

PLASTICIZERS. J. B. Normington and F. C. Duennebier (to Eastman Kodak Co.). U. S. 2,234,705–6, March 11. Plasticizing cellulose esters or ethers with a benzyl, cyclohexyl or tetrahydrofuryl ester of a short chain alkoxybenzoate, or with an ethyleneglycol or ethyleneglycol ether ester of 3,4,5-trimethoxybenzoic acid.

CLASSIFYING TAR RESINS. J. Rivkin (to Neville Co.). U. S. 2,234,708, March 11. Separating a naphtha-soluble and a naphtha-insoluble fraction from the resins formed by distilling coke oven tar.

SAFETY GLASS. H. T. Neher and C. F. Woodward (to Röhm and Haas Co.). U. S. 2,234,829, March 11. Interpolymerizing an acrylate or methacrylate ester with 1 to 15 percent of vinyl alcohol to make a safety glass interlayer composition.

ISOCOLLOIDS. Laszlo Auer (to J. Randolph Newman). U. S. 2,234,949, March 18. Modifying the properties of isocolloid plastics by compounding with 2–10% of a diaminodiarylurea.

PROJECTION SCREEN. R. E. Barclay (to Richardson Co.). U. S. 2,234,950, March 18. A laminated projection screen is made of layers of paper saturated with a clear resin, the pressed and cured.

MOLDED PULP. W. H. Randall and R. L. Emery (to Canal National Bank). U. S. 2,234,979, March 18. A machine for molding pulp articles has a revolving shaft carrying a forming die and a drying die, coacting with another drying die not mounted on the revolving shaft.

METHACRYLATE MOLDINGS. L. B. and H. M. Vernon (to Vernon-Benshoff Co.). U. S. 2,234,993–4, March 18. Softening a polymethacrylate resin in granular form with an equal or smaller weight of monomer and molding the product; and molding a granular polymer under heat and pressure, removing the article from the mold and reheating the surface to restore individual surface particles to their original shape.

TREATING RAYON. H. Dreyfus and R. Wighton (to Celanese Corp. of America). U. S. 2,235,141, March 18. Increasing the resilience of acetate silk by impregnation with a water-soluble resin derived from formaldehyde and urea, thiourea of dicyandiamide, followed by drying the product and heating in presence of an acid catalyst to insolubilize the resin.

INTERPOLYMERS. R. H. Gerke (to U. S. Rubber Co.). U. S. 2,235,149, March 18. Interpolymerizing a diolefin with acrylonitrile or a derivative thereof, and heating the polymer with nitroso-2-naphthol or a *p*-nitrosodialkylaniline.

MOISTUREPROOF FOILS. J. A. Mitchell (to E. I. du Pont de Nemours and Co.). U. S. 2,236,546, April 1. A heat-sealable moistureproof coating for transparent wrapping foils contains nitrocellulose, wax, plasticizer and a terpinene modified alkyd resin.

TRANSFER. Benj. F. Brown. U. S. 2,235,514, March 18. Building up a transfer sheet with layers of tinted and opaque ethylcellulose and an ethylcellulose design on a sized paper backing sheet.

PHENOLIC RESIN. E. H. Balz (to Plaskon Co.). U. S. 2,235,193, March 18. Isolating a phenol-formaldehyde resin from its aqueous medium by precipitation with a boric acid solution.

RESIN PLASTICIZER. Wm. D. Wolfe (to Wingfoot Corp.). U. S. 2,235,625, March 18. Resins made by interpolymerizing butadiene with styrene, acrylonitrile or an acrylate ester are plasticized with a diazoaminoaryl compound.

GREASEPROOF PAPER. H. C. Kelly, W. R. Collings, F. C. Peterson and H. C. Kelly (to Dow Chemical Co.). U. S. 2,235,765; 2,235,798, March 18. Greaseproofing paper containers with a tough, flexible film of ethylcellulose, soluble either in organic solvents or in water.

VINYL INTERPOLYMERS. R. M. Wiley (to Dow Chemical Co.). U. S. 2,235,782, March 18. Interpolymerizing vinyl chloride with vinylidene chloride to form a resin meeting specified solubility requirements.

PURIFYING VINYL RESINS. E. C. Britton and F. L. Taylor (to Dow Chemical Co.). U. S. 2,235,796, March 18. Removing peroxidic catalyst residues from vinyl or vinylidene chloride resins by treatment with a reducing agent such as sodium bisulphite.

MOLDING MACHINE. J. H. S. Skoning (to Skoning Corp.). U. S. 2,235,906, March 25. A device for applying uniform heat and pressure to all exposed surfaces of a molding so that the surface has a smooth even finish.

ION EXCHANGE RESIN. T. L. Wilson (to U. S. Rubber Co.). U. S. 2,235,971, March 25. Making a water-insoluble cation exchange resin by reacting an aromatic hydrocarbon with ethylene dichloride and sulphonating the product.

SAFETY GLASS. G. B. Watkins (to Libbey-Owens-Ford Glass Co.). U. S. 2,236,046, March 25. Flowing a solution of a plastic interlayer onto a cooler sheet of glass so that solvent escapes by diffusion rather than by internal vaporization, and joining a second sheet of glass to the innerlayer.

VINYL ALCOHOL POLYMERS. E. F. Izard and E. J. Kohn (to E. I. du Pont de Nemours and Co.). U. S. 2,236,061, March 25. In making filaments or films of polyvinyl alcohol from its aqueous solutions coagulation is effected by an aqueous solution of an inorganic salt.

REACTIVE RESIN SOLUTIONS. A. Menger (to Plaskon Co.). U. S. 2,236,184, March 25. Retarding the hardening of a urea resin by maintaining it in a potentially reactive state in aqueous ammonia.

TRANSPARENT FOILS. E. M. Kratz (to Marbon Corp.). U. S. 2,236,271, March 25. Making flexible transparent casein foils by dissolving triethanolamine caseinate in water, filtering and adding a plasticizer and an insolubilizing agent to the filtrate.

HOLLOW ARTICLES. R. Serenyi and A. Nadai. U. S. 2,236,416, March 25. An improved machine for molding seamless hollow shapes from a plastic composition.

DECALCOMANIA. A. B. Poschel (to Meyercord Co.). U. S. 2,236,718, April 1. Coating portions of a decalcomania transfer with a plasticized cellulose derivative solution pigmented with magnesia and diatomaceous earth.

AN UNUSUAL JOB WELL DONE
When the REEL LEASH CORPORATION decided to change from metal to plastics, Universal experts were consulted. The result is a product of which we are both justly proud. • Whatever your plastics problem, be sure to consult
UNIVERSAL PLASTICS CORPORATION
CUSTOM MOLDERS
Factory: 235 Jersey Avenue
New Brunswick, N. J.
New York Office:
500 Fifth Avenue
Clarence G. Wood
793 East 152nd St., Cleveland, Ohio

CLASSIFIED

➡ WANTED: Injection Molding Acetate Scrap or Rejects in any form, including Styrene, Acrylic, Vinyl Resin Scrap materials. Submit samples and details of quantities, grades and colors for our quotation. Reply Plastics, 141 Halsey St., Newark, N. J.

➡ WANTED: Stainless Steel or Nickel Kettle, Vacuum Pan, Hydraulic Press, Preform Machine and Mixer. Reply Box 275, Modern Plastics. No Dealers.

➡ PLASTIC MIXING & MOLDING EQUIPMENT—Factory rebuilt—Hot Rolls or Mixing Mills, Hobbing and Die Sinking Presses, Semi-automatic and Standard Molding Presses, Hydraulic Pumps, Accumulators, Intencifiers. Reply Box 294, Modern Plastics.

➡ WANTED: PLASTICS SCRAP OR REJECTS in any form, Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Reply Box 318, Modern Plastics.

➡ 2 OZ. H-P-M INJECTION MOLDING MACHINE FOR SALE—Model #51, in excellent condition. Address Box 433, Modern Plastics.

➡ FOR SALE: 1—Worthington Air Compressor, Type VA-2-SD-750, Size 6 1/2″ x 3 1/2″ x 4″, 150 lb. Pressure, 2-Stage, Complete with Motor and Tank. 1—Curtis #85 Air Compressor, 100 lb. Pressure, Complete with Tank. Reply Box 435, Modern Plastics.

➡ MANUFACTURERS AGENT wants Plastics line for Chicago territory 16 successful years sales and technical experience in molded and laminates is available to manufacturer in exchange for exclusive territorial rights. Reply Box 434, Modern Plastics.

➡ SALES CONNECTION WANTED with fabricator of acrylic or laminated products located in or near New York City. Have had experience in production of laminates and technical sales. Now employed in different field but will be available about June 15th. Reply Box 441, Modern Plastics.

➡ FOR SALE: 2—84″ Mixing Rolls; 10—Semi-Auto. Presses, 75 to 400 tons, ejectors and pull backs; 4—Gould Triplex Hydraulic Pumps, 2—1500 PSI, 35 GPM, 2—3000 PSI, 18 GPM; 12—30″ x 40″ Platen, 500 ton Hydraulic Press, 1—W.S. 15 x 18r Hyd. Press, 9r dia. ram, 4—r posts; 1—W.S. 24 x 48r Hyd. Press, 12r dia. ram, with hyd. pushbacks; 1—46r x 54r Hyd. Press, 19r dia. ram; 1—Thropp 36r x 36r 4-opening Hyd. Press, 12r dia. ram; 2—Bethlehem 38r x 78r Hyd. Presses, with 20r dia. rams; 1—Farrell two-cylinder vertical Hyd. Extrusion Press and Pump; Birm. 16 x 36 Mixing Rolls, silent chain 40 HP drive; 2—Farrell 60r Mixing Rolls, 4r Extruder; 7—W. & P. Mixers. Send for Complete List. Reply Box 437, Modern Plastics.

➡ WANTED: MOULD MAKER, first class man, thoroughly experienced on injection moulds, able to take charge in shop in large New England city. Reply Box 438.

➡ FOR IMMEDIATE SALE: Semi-Automatic Hydaulic Presses, 2—125 Ton, 13″ Ram, 23″ x 17″ platens, 2000 lbs. per sq. in. 1—400 Ton Horiz. Hydraulic Extrusion Press. 1—Hydraulic Scrap Baler, 80 Ton, 6 1/2″ Ram, 90″ stroke, 5000 lbs. per sq. in. Large stocks Hydraulic Presses, Pumps & Accumulators, Preform Machines, Rotary Cutters, Mixers, Grinders, Pulverizers, Tumbling Barrels, Drill Presses, Lathes, Gas Boilers, etc. Send for Bulletins #156 and #128, and L-17. We also buy your surplus machinery for cash. Reply Box 439, Modern Plastics.

➡ INDUSTRIAL DESIGNER, executive in one of the oldest and largest design firms, is interested in heading Department of Design for reputable manufacturer or sales organization. Reply Box 440, Modern Plastics.

➡ We wish to offer for sale one French Oil Machinery Press, 150 ton capacity, self contained molding press, practically new, purchased in 1936. This press may be seen at our plant. Reply Box 436, Modern Plastics.

➡ YOUNG, MARRIED, INJECTION MOLDING TECHNICIAN now employed desires change. Six years experience on all type machines and materials. Best of references. Reply Box 442, Modern Plastics.

Foreign plastics patents

Application dates are given for patents of European countries, but for Canada the issue date is given

TRANSFORMER. E. Herpichböhm (to Allgemeine Elektricitäts-Ges.). German Patent 697,767, March 24, 1938. The iron core of a transformer is spaced apart by means of spacers formed from a plastic insulating composition.

ROTOR. Alfred Kath. German Patent 697,787, Sept. 3, 1937. Rotors of centrifugal pumps or blowers are made of acid-proof plastic material.

DIPPED ARTICLES. K. Bratring and A. Boecler (to Dr. Kurt Bratring). German Patents 698,029 and 698,030, June 19, 1938. Dipping machine for making shaped articles from cellulose derivative solutions.

METALLIZED EFFECTS. E. Bauer (to Dr. F. Raschig G. m. b. H.). German Patent 698,187, Jan. 13, 1938. Imparting silver luster effects to phenol-aldehyde resin surfaces.

TESTING PLASTICS. H. Hauttmann (to Gutehoffnungshütte Oberhausen Akt.). German Patent 698,034, Oct. 2, 1937. Instrument for measuring hardness of test pieces made from molding compositions.

MOLDING POWDER. A. A. Vansheidt and Z. K. Naumova. Russian Patent 53,816, Sept. 30, 1938. Condensing urea with formaldehyde and hexamethylenetetramine, with oxalic acid as condensing agent, in presence of a fibrous filler, heating the product to 2–5 percent moisture content and grinding it to powder.

PHENOL-ALDEHYDE-SILANE RESINS. S. N. Ushakov. Russian Patent 53,752, Aug. 31, 1938. The free hydroxyl groups of a resol or novolac resin are etherified by reaction with a mono- or polychlorotetraethylsilane.

CELLULOSE SILANE ETHERS. S. N. Ushakov. Russian Patent 53,811, Sept. 30, 1938. Etherifying cellulose by reaction of alkali cellulose with mono- or polychlorotetraethylsilane.

FILM FORMER. I. G. Farb. Akt. British Patent 513,146, Oct. 4, 1939. A chlorinated synthetic rubber for lacquers is prepared by emulsion polymerization of butadiene in presence of a plasticizing and solubilizing agent such as ditolyl disulphide, followed by chlorination.

VARNISH RESIN. Erich W. Frenkel (trading as the firm Hermann Frenkel). British Patent 513,113, Oct. 4, 1939. A resin for resistant wood finishes is made by effecting a phenol-formaldehyde and a urea-aldehyde condensation simultaneously in the same system under such conditions that the phenolic component is hardenable without being heated.

ACETAL RESINS. Eastman Kodak Co. British Patent 513,117, Oct. 4, 1939. Polyvinyl alcohol is acetalized with a blend of 3 aldehydes in which one member is formaldehyde or acetaldehyde, another is the aldehyde of propionic, butyric or heptoic acid and the third is benzaldehyde or its *o*-chloro- or *m*-nitro-derivative.

ELECTRIC SWITCH. British Thomson-Houston Co., Ltd. British Patent 513,492, The gas-evolving composition in self-generating gas blast type switches comprises an explosive such as nitrocellulose and a combustion retarder such as a urea resin or a vinyl or acrylate compound, which limits gas evolution to the immediate region of the arc to be extinguished.

POLYSTYRENE. Bakelite, Ltd. British Patent 513,256, Oct. 9, 1939. Polymerizing styrene to a molecular weight of above 40,000 and extracting all methanol-soluble polymer in excess of 3 per cent, to form a resin suitable for molding compositions.

FLAT FINISHES. I. G. Farb. Akt. Holland Patent Application 86,634, Nov. 15, 1940. The film-forming component of a dull finish lacquer comprises 50 to 65 percent of an oil acid modified alkyd resin, 10 to 40 percent of a cellulose derivative and the remainder a highly chlorinated rubber or rubber-like product.

VINYL ETHER RESIN. I. G. Farb. Akt. Holland Patent Application 87,187, Nov. 15, 1940. A nonwaxy but water-insoluble vinyl ether resin is emulsified in water with the aid of an emulsifying agent which itself has drying properties, to make an emulsion paint.

VINYL RESIN FOILS. M. C. Agens (to Canadian General Electric Co., Ltd.). Canadian Patent 394,660, Feb. 18, 1941. Strong, flexible transparent foils of polyvinyl chloride plasticized with an ester of acetylricinoleic acid.

PHENOL-KETONE-ALDEHYDE RESIN. Wm. H. Moss (to Henry Dreyfus). Canadian Patent 394,732, Feb. 18, 1941. Condensing a phenol with a chlorinated aliphatic ketone and condensing the product with formaldehyde to form a resin which is suitable for molding compositions and is compatible with cellulose acetate in lacquers.

PLASTIC SULPHUR COMPOUND. Rudolf Schröter and Wilhelm Becker. Canadian Patent 394,888, Feb. 25, 1941. Making a plastic product by reaction of sodium, calcium or ammonium polysulphide with bis(2-chloroethyl)formaldehyde acetal or with the corresponding mercaptal.

LAMINATED SKI. Hamish McL. Davidson. Canadian Patent 394,904, March 4, 1941. Forming a ski with a wood core, faced on both sides with a strip of wood bonded to the core by a thermosetting resin.

REAR PROJECTION SCREEN. Wm. H. Moss (to Henry Dreyfus). Canadian Patent 395,033, March 4, 1941. Swelling acetate silk with a plasticizer and doping with polyvinyl acetate to obtain a rear projection screen with good optical properties.

CREASEPROOFING RAYON. D. Finlayson and R. G. Perry (to Henry Dreyfus). Canadian Patent 395,204, March 11, 1941. Creaseproofing acetate silk by swelling the fabric in a solution of an intermediate formaldehyde condensation product of urea, thiourea or dicyandiamide, drying the fabric and heating to set the resin.

CREASEPROOFING RAYON. R. W. Moncrieff (to Henry Dreyfus). Canadian Patent 395,205–6, March 11, 1941. Impregnating acetate silk with 30% aqueous methanol containing in solution formaldehyde and urea, thiourea, guanidine, dicyandiamide, biuret or an alkyl- or a alkylurea and heating the impregnated fabric to form a water-insoluble resin therein.

VINYL ALCOHOL PLASTIC. H. Berg (to Chemische Forschungages.). Canadian Patent 395,216, March 11, 1941. Hydrolyzing polyvinyl acetate in presence of methanol, sodium methylate and methyl acetate to form a plastic product, and mechanically working the product.

LEAROK—The Clean Compound Without Free Grease for Cutting and Buffing

8 Grades for Cutting
11 Grades for Cut and Buff
7 Grades for Buffing

List of Plastics for which LEAROK has been tested and proved

PHENOL FORMALDEHYDE MOLDING

Bakelite, Catalin, Celeron, Durez, Durite, Heresite, Inclur, Insurok, Uniplast, Makalot, Neillite, Resinox, Textolite

PHENOL FORMALDEHYDE CAST

Bakelite, Catalin, Gemstone, Marblette, Monsanto CP

UREA FORMALDEHYDE MOLDING

Bakelite, Beetle, Plaskon

ACRYLATE & METHACRYLATE

Crystalite, Lucite, Plexiglas

STYRENE

Bakelite, Styron

HARD RUBBER

Ace, Luzerne, Rub-Tex

CASEIN

Ameroid, Gala, Galorn

ETHYLCELLULOSE

Ethocel

CELLULOSE ACETATE

Bakelite, Lumarith, Masuron, Monsanto CA, Tenite, Nixonite, Plastacele

CELLULOSE ACETATE BUTYRATE

Tenite II

CELLULOSE NITRATE (Pyroxylin)

Celluloid, Monsanto CN, Nixonoid, Pyralin, Soy Bean

The above information is indicative of the extensive research work we have carried on in the past few years in adapting this widely used compound—LEAROK—to plastics. We suggest that you send us samples of your work with an outline of what you wish to have done. Our technical men will recommend the grade of LEAROK which should reduce your costs of cutting and buffing.

THE LEA MFG. CO.

WATERBURY, CONN.

Specialists in the Production of Clean-Working Buffing and Polishing Compounds

There's a proper place for everything . . .

the proper place for your NON-metallic "What Material?" problem is with

CONTINENTAL-DIAMOND

(*1*) C-D makes many types of NON-metallic materials . . . DIAMOND Vulcanized Fibre . . . DILECTO Phenol Fibre . . . CELORON molded fabric plastics and silent gears . . . MICABOND . . . VULCOID.

(*2*) Established in 1895 . . . laminators of molded plastics since 1911 . . . laboratory research dating to 1914 . . . C-D has accumulated a wealth of NON-metallic "know how."

(*3*) Five large, modern, completely equipped plants in this country and Canada are geared to furnish C-D materials in standard sheets, rods, tubes; or parts—fabricated molded or formed to your specifications.

C-D manufacturing experience and laboratory research has helped many manufacturers to use C-D NON-metallics to advantage. C-D can help you too! . . . Send today for booklet GF6 . . . "What Material?"

Continental-Diamond FIBRE COMPANY

"Manufacturers of Laminated Plastics Since 1911"

NEWARK • DELAWARE

Publications

Write direct to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices

Physical Chemistry of High Polymeric Systems

by H. Mark

Interscience Publishers, Inc., 215 4th Ave., New York, 1940
Price $6.50 **345 pages**

The importance of tools in industrial production has been forcibly brought home to all of us recently during the months that have elapsed in the process of translating blueprinted ideas into finished products. A supply of proper tools is equally crucial to scientific production if progress is to be made in transforming hypothetical conjectures into systematic disclosures of the modus operandi of this universe. Professor Mark has performed a real service to scientists engaged in investigating high polymers by comprehensively surveying the various means that are available for exploring further into the relation between the structure and properties of these technically, biologically important materials.

What physical and chemical methods have proved necessary and effective in the preparation, purification, examination, and elucidation of the high polymers? In what manner and under which conditions can the fundamental laws of physical chemistry be applied to the high polymers? These are the problems which the author deals with in this volume.

Seven major topics discussed are (1) Geometry of Molecules, (2) Internal Motions of Molecules, (3) Primary and Secondary Valences, (4) Crystal Structure, Lattice Forces, and Chemical Structure of the Unit Cell, (5) Molecular Arrangement in Liquids and the Investigation of Very Minute Crystals, (6) Behavior of Mixtures, and (7) Kinetic Phenomena. The well established methods of physical chemistry, such as x-ray, dipole moment, vapor pressure, osmosis, viscosity, diffusion, and reaction kinetics, are shown to be applicable in the development of the fundamental chemistry of high polymers. The well outlined and logical arrangement of the subject matter and ample references to the original literature add greatly to the value of this book. It is a worthy addition to the series of monographs on the chemistry, physics, and technology of high polymeric substances, of which Vol. I was reviewed in the January 1941 issue of MODERN PLASTICS. G. M. K.

Temperature—Its Measurement and Control in Science and Industry

Sponsored by the American Institute of Physics and associated organizations

Reinhold Publishing Corp., 330 W. 42nd St., New York, 1941
Price $11.00 **1362 pages**

This book is the record of a symposium on temperature held in New York in November 1939. The authors of the papers represent government agencies, universities, and industry. The major topics considered are temperature scales, precision thermometry, education in pyrometry, temperature in natural sciences, biology, and physiology, automatic temperature regulation and recording, applications in special measurements, general engineering, and the metals, ceramics, and oil industries, optical and radiation pyrometry, and thermometric metals and alloys. Commemorating the 20th anniversary of a symposium on pyrometry, this collection of papers on modern developments in the same field should be a valuable reference work for some years to come. G. M. K.

★ *PLASKON RESIN GLUE* IS THE TITLE OF A GOOD-looking brochure recently issued by Plaskon Co., Toledo, Ohio. Attractive four-color plates and black and white illustrations show applications of this synthetic resin adhesive and the text points out advantages, features and uses. Additional information on both cold-setting and hot-setting types of this urea-formaldehyde glue are contained in separately inserted folders.

★ SHAPED LIKE A CONTAINER OF PRETZELS WITH A transparent plastic cover and plastic comb binding, the new 32-page catalog issued by Monsanto Chemical Co., Plastics Division, shows "how Vuepak helped 20 manufacturers to package for greater sales." The catalog is completely illustrated and for each product such points as the market, the old package, comparative costs and advantages are discussed.

★ AN 8-PAGE BOOKLET DEVOTED TO A DISCUSSION of molding equipment has been issued by F. J. Stokes Machine Co., Philadelphia, Pa. The booklet illustrates and describes various automatic and semi-automatic molding machines.

★ *DUREZ SPECIAL RESINS* IS THE TITLE OF A PAMPHlet issued by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., listing specific grades of resin for certain uses.

★ CARPENTER STEEL CO., READING, PA., HAS PUBlished a comprehensive 36-page booklet on tool steels, *Tooling up for Plastics*. Authoritative information has been included on selecting appropriate steels for particular purposes. To simplify the procedure a simplified selector table is incorporated. Detailed physical data and metallurgical composition are also included on the various grades of mold steels. In addition to being readily accessible in concise chart form, the various features of the respective properties are also described. An informative question and answer section will settle many questions which frequently arise in selecting steels for molds. A section is also devoted to the important subject of tool steels for hobs. A ready reference Hardness Conversion Table is also a feature. To facilitate its use the booklet has an indented finger index. The booklet is an important, authoritative contribution of information to the fundamental subject of metal for molds.

★ A COMPREHENSIVE REPORT ON *THE OUTPUT OF Manufacturing Industries, 1899–1937* has been published by the National Bureau of Economic Research, Inc., New York City. The report was prepared by Solomon Fabricant of the Bureau's research staff. The book contains 700 pages, 66 text tables, 24 charts and 4 appendices.

★ THAT THE BRITISH PUBLISHERS ARE DOING THEIR share to uphold the dictum of the slogan "Britain Delivers the Goods," is convincingly evidenced by the last edition of *Aircraft Production*, the journal of the British Aircraft Manufacturing Industry. With all that we regularly review many publications which would tend to jade our appreciation, this magazine inspires special comment. Both the format and the editorial comment of the book would be a credit to any American publisher operating under comparatively normal conditions. The editors have obviously sought to include significant information on important constructional airplane problems. They have, for example, treated in detail of the application of transparent plastic sheets for cabin enclosures and turrets. Merits of production line methods for large-scale airplane construction, are discussed and reports are included on new machine-tool developments as well as smaller tools. They have exhaustively reviewed American airplane manufacturing. The subjects included indicate careful, complete, authoritative preparation.

The British airplane producers are fortunate in having an active reliable source for current information, data and news. The publishers of *Aircraft Production* are performing an essential service with creditable distinction.

MORE PROFITS *with an* ELMES HYDRAULIC LABORATORY PRESS

ADVANTAGES

1 Adapted to test and experimental runs as well as small batch production. Can be used for a great variety of applications.

2 Entirely self-contained.

3 Maintains constant pressure against a dead head for long periods of time by means of improved new valve with special packing.

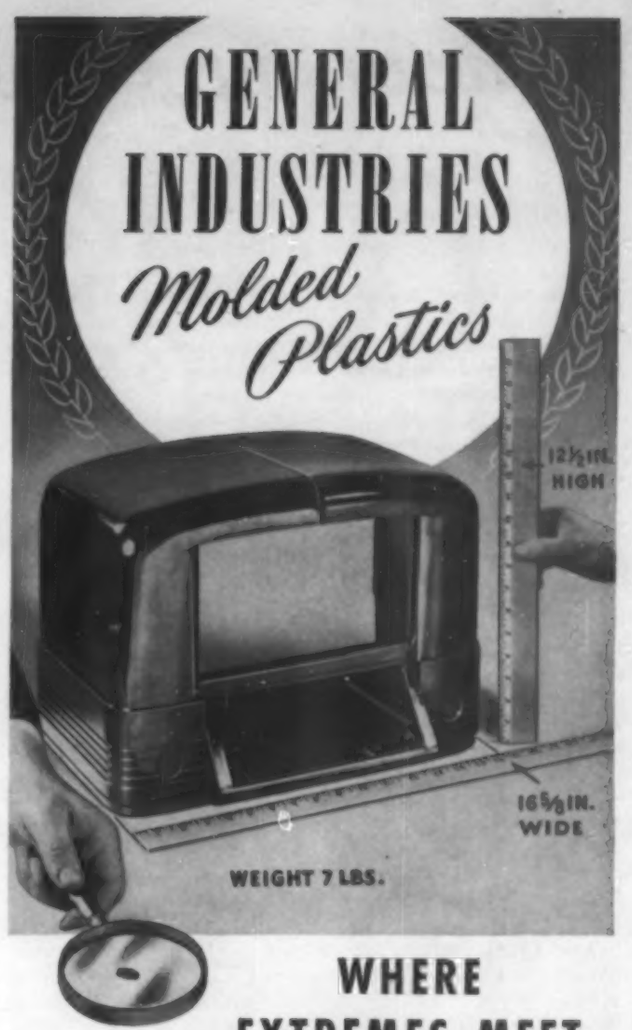
Trustworthy performance details for production guidance are easily and economically obtained on a small scale with this Elmes Hydraulic Laboratory Press.

The unit is saving time and needless repetition of tests in many leading laboratories where it has proved to give reliable results and ease of operation, in accordance with the high standards set by Elmes Presses of larger capacity.

Find out from Elmes how this versatile Laboratory Press can contribute to your experimental and production progress—at small cost. Facts and figures are yours for the asking, without obligation.

Also Manufactured in Canada
Williams & Wilson, Ltd., Distributors

CHARLES F. **ELMES** ENGINEERING WORKS
225 N. MORGAN ST. *Chicago* SINCE 1851



WHERE EXTREMES MEET

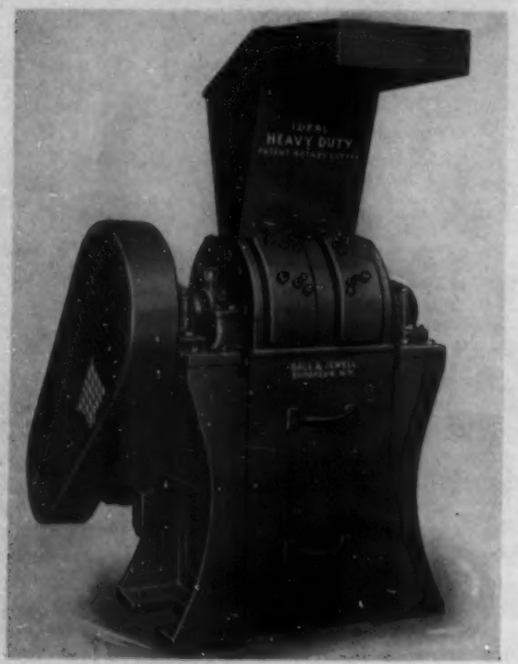
The dimensions of your molded plastic piece may run into many inches, or only a few hundredths of an inch. No matter. Here at General Industries we are prepared to handle any specification to your fullest satisfaction—to meet your most exacting requirements for accuracy and fine finish. Our equipment is thoroughly modern, including presses for molding pieces of the largest sizes and most difficult shapes. All operations are combined under one roof, including making our own molds.

Let us figure on your next job. Send blue prints and indicate your monthly requirements.

The GENERAL INDUSTRIES Co.
Molded Plastics Division • Olive and Taylor Sts., ELYRIA, OHIO
PHONE OFFICE NEAREST YOU: • CAMDEN, N. J., Phone Camden 2218
CHICAGO, Phone Whitehall 4343 • NEW YORK, Phone Longacre 5-4107
DETROIT, Phone Madison 2146 • INDIANAPOLIS, Phone Lincoln 6317
MILWAUKEE, Phone Daly 4057 • ELYRIA, Phone 2238

Machinery and equipment

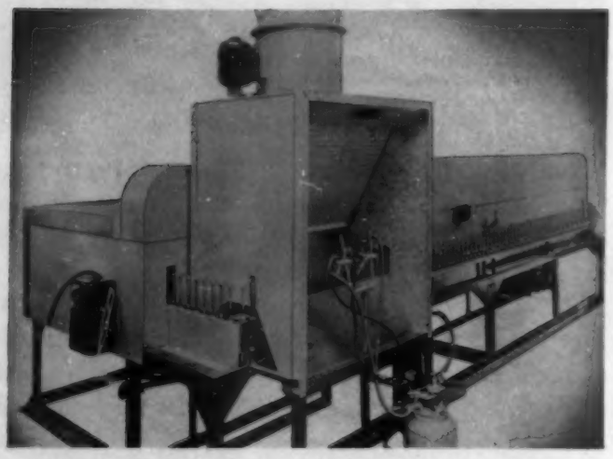
★ SPECIALLY BUILT FOR CUTTING HEAVY SCRAP plastics up to 1 in. in thickness the Ideal Scrap Grinder shown below and made by Ball & Jewell is small and compact. It is the same in over-all dimensions as the standard Ideal grinder. The differences are: heavier castings made of solid cast steel, while the Standard model is lighter and made of cast iron; heavier solid tool steel knives $^{5}/_{8}$ in. in thickness—the Standard has $^{3}/_{8}$ in. knives; Five-h.p. motor; Standard has 3 h.p. Texrope 3-belt drive, the Standard has 2-belt; capacity 150–250 lbs. per hr., interchangeable screens.



★ THE PORTER-CABLE MACHINE CO. ANNOUNCES another addition to its line of Speedmatic saws. This machine carries a $6^{1}/_{2}$ in. diam. blade, with cutting capacity of 2 in. material, yet weighs only $15^{1}/_{2}$ pounds. The blade travels at 7200 r.p.m., producing a cutting edge speed in excess of two miles a minute. It is said by the manufacturer that through the use of the helical cut gear drive in this tool 98 percent of the motor power is transmitted to the driveshaft in comparison with the usual 76 percent delivered in worm gear driven high speed saws. The base raises and lowers for depth adjustment, and tilts to 45 degrees for bevels, according to the report.

★ A NEW SEVERANCE CUTTING TOOL FOR DEBURring ends of rods and tubing, formerly supplied on special order is being made to aid in the removal of rough edges or burrs by producing a slight chamfer and, also, in the removal of flash or similar conditions from the edges of bosses, collars, bushings, etc., of cast, forged and molded parts. It has a standard mouth angle, which produces a chamfer of either 30 or 45 deg. as required—all other mouth angles to special order. Each size cutter covers rod diameters within the range of its mouth angle, i.e., diameters between the recess or "hole" diameter and the mouth or "rod" diameter. The tooth design is claimed to produce a shearing cut that forces the chips out or from the tool, thus preventing loading.

★ ANTICIPATING THE NEED FOR GREATER CAPACity machines to speed up the production of large plastics parts where multiple unit injection molding is not required, Hydraulic Press Mfg. Co. has designed and built a 12-oz. single nozzle injection molding press. It is reported that this machine incorporates into its design the powerful straightline hydraulic clamp, important for molding large parts. Advantages claimed are: positive sealing of mold halves by the clamp assembly, automatic adjustment for molds of any thickness to keep die set time to a minimum and rapid speed of the injection plunger.



★ A NEW AUTOMATIC UNIT FOR APPLYING BRONZE lacquer to plastic closures of the type used on liquor and whiskey bottles has been developed by Paashe Airbrush Co. The machine (above) consists of a specially designed automatic air-finishing unit with a structural steel frame approximately 16 ft. long by 7 ft. wide. This is equipped with steel roller chain supporting 1250 spindle assemblies, set on $2^{1}/_{2}$ in. centers and with removable carrying fixtures. A friction drive is provided for rotating the spindles at the coating station. At this coating station, automatic airbrushes apply the lacquer in a spray booth equipped with a belt-driven ventilating unit run by $^{1}/_{2}$-hp. explosion-proof motor. The chain passes from the spray booth into an electrically heated oven, equipped with electric strip heaters thermostatically controlled. It is made in two sections, one for preheating closures prior to applying the lacquer and the other for drying purposes. The machine has a 12-gal. pressure feed tank, complete with hose and fittings. (*Please turn to next page*)

TRY this Money-Saving Fastening Method!

DRILL AND DRIVE ...that's all!

ELIMINATES INSERTS AND TAPPING!

SHAKEPROOF

Thread-Cutting Screws

Type 2 Double-Slot

Type 9 Multi-Flute

Cut their own threads in any Plastic!

Now you can save the costs of threaded inserts or separate tapping! Shakeproof Thread-Cutting Screws—designed especially for plastic applications—actually cut their own threads just like a tap in either molded or laminated sections. The result is a stronger, tighter fastening for each screw remains in the threads it has cut itself, which assures a snug fit.

WRITE FOR SAMPLES!

Test these money-saving screws on your own product. Samples will be gladly furnished—be sure to indicate type desired!

SHAKEPROOF LOCK WASHER CO.

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS

2531 North Keeler Avenue, Chicago, Illinois

Plants at Chicago and Elgin, Illinois

In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

Foreign Licensees: Barber and Colman, Ltd., Brooklands, Manchester, England
Carr Fastener Co., of Australia, Ltd., Royal Park, South Australia

Copyright 1941 Illinois Tool Works

SHAKEPROOF — Fastening Headquarters — Thread-Cutting Screws . . . Locking Screws . . . Spring

ROUGH to SMOOTH

FINISHES with SPEED when you use

THE 3-M METHOD

for Finishing Molded Plastics and Hard Rubber

Removing outside edge flashings and polishing flat surfaces.

Removing inside flashings.

Speed and efficiency in removing flashings, mold parting lines and surface irregularities—developing smooth surfaces that readily buff out to desired polish are the satisfying results obtained with the 3-M Method. In addition, dust, fire hazard and danger of scorching are eliminated.

Our engineering staff will gladly offer suggestions regarding your finishing problems. Just fill in the coupon below.

Made and Patented in U. S. A. by

MINNESOTA MINING & MFG. COMPANY

SAINT PAUL MINNESOTA

Branches in Principal Cities DEPT. MP 841

Gentlemen: What are your suggestions for finishing _____

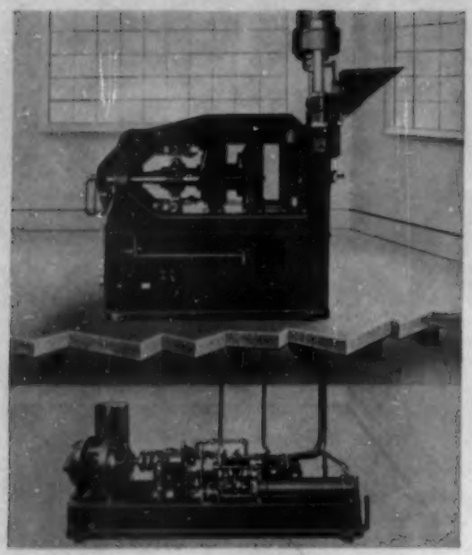
_____

Name _____

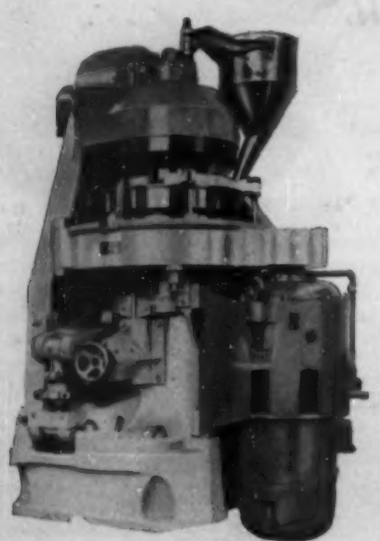
Address _____

City _____ State _____

MAIL THIS COUPON TODAY!

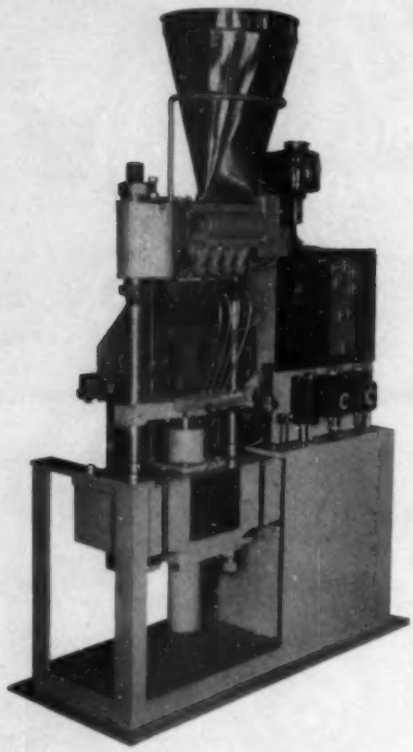


★ THE TWO-UNIT INJECTION MOLDING MACHINE manufactured by Lester Engineering Co. shown above is a large 8-oz. unit with the hydraulic equipment placed on one base and the molding equipment on another. Many advantages are claimed for such a design particularly for ease, accessibility and low cost of servicing and maintenance. Having the power base with the hydraulic equipment (consisting of motor, pumps, valves and piping) mounted on a separate base with no housing or obstructions over them, everything is open and available for inspection and servicing. Ability to inspect and service while the machine is in production, without interfering with the operator, should allow greater production. Not only will the lost time for repairs be much less but the time and cost of the repairs which are necessary should prove to be much less due to the accessibility of the equipment.



★ F. J. STOKES MACHINE CO., IS OFFERING A NEW and larger rotary tablet compressing machine reported to be capable of applying 30 tons pressure and producing parts with a maximum diameter of 2½ in. This machine has a maximum die fill of 4 in., is arranged for making cored and special-shaped pieces, has ten sets of punches and dies and applies pressure from both top and bottom simultaneously, according to the release. Weight is 16,000 lbs; height 8 ft. 4 in. Motor drive is direct, through geared speed reducer. A patented, combined pressure equalizer and automatic excess pressure release is provided to spill overloads and prevent jamming or breakage. The output of the machine is 150 pieces per min. when the full number of 10 punch and die sets are in use. Limited production is possible, if desired, by using only one or a few sets of punches.

★ LEWIS-SHEPARD SALES CORP. ANNOUNCES ITS new stacking device for handling the dumping of drums, barrels and many other liquid or dry material containers. This drum-dumping stacker permits is said to control of dumping by the operator from the floor, thus eliminating standing on boxes, improvised platforms and the like. A self-locking worm makes it possible to hold the drum for as long as desired at any position. Control from the floor also permits the operator to reverse the tilt of the drum or barrel to slow down or stop the flow of material from the container, according to the report.



★ THE AVAILABILITY OF A LARGER MODEL CROPP completely automatic molding press, capable of producing items with an area as large as 16 in., has recently been announced by the company. The machine, pictured above, is said to have all the advantages of the 12-ton model plus certain new features—built-in electric control, four-cavity motor-operated loader as standard, added push button control for air release. Incorporated in the panel of the machine is a counter which records the number of cycles of the machine and, thus, by simply multiplying the number of cavities in the mold, one can readily determine the number of pieces finished. The company reports that they will shortly announce a 30-ton hydraulically operated automatic model which will be completely self-operating and self-contained.

★ DEVELOPED BY BOWEN RESEARCH CORP. BEcause of the necessity of high speed for fineness of atomization in small spray-dryers, a new 2 hp. steam turbine is claimed to travel at approximately 30,000 rpm. or about 6½ miles per min. peripheral speed. Of the single-stage-radial-impulse variety, this unit is prevented from over-speeding by a pressure reducing valve, the maximum allowable steam pressure being 30 lb. per sq. in. gage pressure.

MODERN METHODS OF MARKING

Here is the KD7

For rapid, one color work, it has gained many new friends

Model KD7

The industrial Who's Who *(famous names on request)* have recently discovered things about our Model KD7. With an already well earned reputation as a box and label printer, the horizon of usefulness of our KD7 is considerably widened.

Polystyrene liquor pourers, phenolic refrigerator relay cases, laminated binding post strips, urea dials, etc., testify to the KD7's new found popularity.

An adjustment to the work table permits the use of plastic-type molds to hold many different shapes and contours of plastic pieces. Unique visibility of work for accurate location of imprint, rapidity of type changes for variable designations, the use of rubber printing elements to prevent breakage, the very low cost of printing dies, and the extremely efficient use of quick dry inks from enclosed, quickly interchangeable *(for color)* ink reservoirs, are the more important features that commend the KD7 for rapid, one color work.

If you would like to know more about the Model KD7, or about any of the many other Markem Plastic Printers, or if any present work requires a better marking, our thirty years of specialization in this one field is entirely at your disposal.

Enclosed
Model KD7

MARKEM MACHINE CO., 60 Emerald Street, Keene, N. H.

MARKEM PLASTIC PRINTERS

make certain that your molder is MARKEM equipped

Save on short runs or long . . . with molds and hobs of the right DISSTON STEEL

Whether your plastic molding problem involves short runs or mass production, you'll find the right answer for mold and hob steels in Disston's "Big Four."

These four special Disston Steels are carefully manufactured in modern electric furnaces. Each steel meets a specific plastic molding requirement . . . each is uniformly sound, with no hard spots or spongy areas.

- **DISSTON PLASTIRON** is a clean, soft iron that carburizes readily, produces smooth cavities, and is adapted to short runs and difficult shapes.
- **DISSTON PLASTALLOY** combines core strength and abrasion resistance with ease of hobbing. Cavities are tough and resist wear.
- **DISSTON NICROMAN** is ideal for forces, punches and machined molds . . . it is tough, durable and highly resistant to abrasion.
- **DISSTON CROLOY** provides great hardness and compressive strength coupled with excellent wear resistance and core strength. Your best choice for long runs and precise part production.

It pays . . . in fewer rejects and increased output . . . to specify Disston Steel of the correct grade for plastic molds and hobs. Our metallurgists will be glad to help with your problems, whether you make molds and hobs, or use them. Write to Henry Disston & Sons, Inc., Philadelphia, Pa., U.S.A.

DISSTON

MOLD STEELS · HOB STEELS

In the limelight

★ THE AMERICAN CYANAMID CO. HAS CHANGED the name of its Beetle Products Division to Plastics Division, according to a recent announcement. C. J. Romieux is sales manager of the division in charge of commercial activities and Dr. K. E. Ripper, chief technologist, heads its technical activities.

★ A NEW CANADIAN SOCIETY TO BE KNOWN AS "The Montreal Rubber and Plastics Group" was organized March 28, 1941, at a meeting at McGill University, attended by members of the local rubber and plastics industries. The aims of the Society are "to provide an opportunity to discuss common interests and problems and to keep abreast of recent developments." At the organization meeting the following provisional executives were elected: Chairman, M. F. Anderson, Director of Development, Dominion Rubber Co.; vice-president, J. H. McCready, Secretary, Hale Brothers Ltd.; secretary-treasurer, R. V. V. Nicholls, assistant professor of chemistry, McGill University. Members: F. A. Todds, Northers Electric Co., A. B. Lewis, British Rubber Co., P. Gunter, Mack Molding Co., R. P. Bales, Dominion Rubber Co.

Interested chemists, engineers, technicians and salesmen in the Province of Quebec are cordially invited to associate themselves with the new Montreal Rubber and Plastics Group. For further information apply to Dr. R. V. V. Nicholls, Department of Chemistry, McGill University, Montreal, Canada.

★ CHICAGO EXTRUDED PLASTICS CO., 1209 WEBSTER Ave., Chicago, Ill., has recently announced completion of improved methods and facilities to extrude plastics in continuous lengths and innumerable cross-sectional patterns. The products announced include flexible plastic conduit tubing, threads and various shapes.

★ F. J. STOKES MACHINE CO. HAS RECENTLY COMpleted construction, at its Tabor Rd. plant, of a new brick and concrete addition which has increased floor space more than 50 percent and provided needed room and facilities for the greater output of its completely automatic molding machines.

★ MICHIGAN MOLDED PLASTICS, INC., DEXTER, Mich., announces that a new, two-story addition is being added to their building to take care of new equipment that has recently been installed. The building will house a portion of the finishing department, mold repair department and material storage. The first floor of the building will have showers, a recreation room and the maintenance division.

★ BAKELITE CORP., UNIT OF UNION CARBIDE AND Carbon Corp., announces the transfer of W. T. Cooper, Sales Engineer, to Chicago, Ill., where he will be located in the Carbide and Carbon Bldg., 230 North Michigan Avenue.

★ HARRY A. HUSTED, FORMERLY EXECUTIVE SALES engineer of the Thermoplastics Division of the Standard Products Co. and past president of the H. A. Husted Co., has opened an office in the Boulevard Bldg., Detroit, Mich. His facilities there are organized for performing engineering sales development and production work in various materials. Mr. Husted, a member of the Army Ordnance Association, has developed many original devices in plastics for the military services.

★ THE PLASTICS DIVISION OF ERIE RESISTOR CORP., Erie, Pa., reports it has expanded molding facilities and is now producing continuous extruded plastics from a wide range of materials in any desired color from opaque to translucent. Custom designed moldings in the form of solid rods, tubing, half rounds or any other shapes that lend themselves to the extrusion process, are molded in continuous lengths of any desired size up to a maximum diameter of 7/8 inch. Very small thread and strips for weaving purposes can be precision molded.

★ NIXON NITRATION WORKS, INC., NIXON, N. J., reports that Charles Schuster, plant superintendent, has been appointed general manager of the company. M. W. Peters was made general sales manager in charge of sales direction and policy. H. A. Hendrickson was appointed credit and office manager.

★ CARL WHITLOCK HAS JOINED THE TECHNICAL Service Department of Monsanto Chemical Co.'s Plastics Division. Formerly with Norton Laboratories, General Industries and Firestone Rubber & Latex, Mr. Whitlock will devote his time to developing new uses for plastics and in assisting molders and users in technical problems.

★ REPRESENTATIVES OF FIFTEEN LARGE MANUfacturers of plastics met April 24th in New York City and formed an association aimed at "offering co-operation in utilizing plastics for defense purposes." The group will be known as the Plastic Materials Manufacturers' Association, and includes a large share of the companies producing plastics in this country. Arnold E. Pitcher, general manager of the Plastics Dept., E. I. du Pont de Nemours and Co. was named president. L. M. Rossi, vice president of the Bakelite Corp., was elected vice president and John E. Walker, of Washington, D. C., secretary and treasurer.

Mr. Pitcher described the organization as a movement to coordinate the resources of the member firms in a common effort. "As a result of the constantly increasing use of plastics for defense purposes and the necessity of working out suitable substitutes for some essential metals of which there is now a shortage," said Mr. Pitcher, "the plastic materials manufacturers felt it was important for the industry to be organized on a basis where better and more complete cooperation could be extended to the Army and Navy Munitions Board in utilizing plastics for defense purposes."

The new organization, he explained, is an outgrowth of the Cellulose Plastic Manufacturers' Association, which included only those firms making plastics based on cellulose. This group was formed in 1919. The new association includes those concerns whose materials are based on urea, phenol derivatives, vinyl resins, casein, acrylics, cellulose and styrene.

An important phase of the program was the appointment of a committee on defense and government relations, the duties of which are to act as a contact between the association and the Army and Navy Munitions Board, or any other government agency interested in the organization's activities. L. M. Rossi was named Chairman, with J. C. Brooks, of Monsanto Chemical Co. and C. B. Kirsopp, of Röhm and Haas Co., Philadelphia, as members. Mr. Pitcher and Mr. Walker serve in ex officio capacities. Other objects of the association, as outlined at the meeting, include promotion of the general welfare of the plastics industry; increasing the use of plastics in the arts and industries and a study of ways and means of eliminating waste in production, distribution, and the promotion of safety measures.

Members of the new organization are as follows: American Cyanamid Co., American Plastics Corp., Casein Co. of America, Catalin Corp., Celluloid Corp., Durez Plastics and Chemicals, Inc., E. I. du Pont de Nemours & Co., Durite Plastics, Monsanto Chemical Co., Nixon Nitration Works, Plaskon Co., Inc., Reilly Tar and Chemical Corp., Röhm and Haas Co., Tennessee Eastman Corp. and Bakelite Corporation. (*Please turn to next page*)

For Research

in thermoplastic and thermosetting plastics

THE CARVER LABORATORY PRESS

Comes with both electric or steam-and-cold-water hot plates for molding either basic type of plastic. Up to 10 tons pressure on 6" by 6" platens.

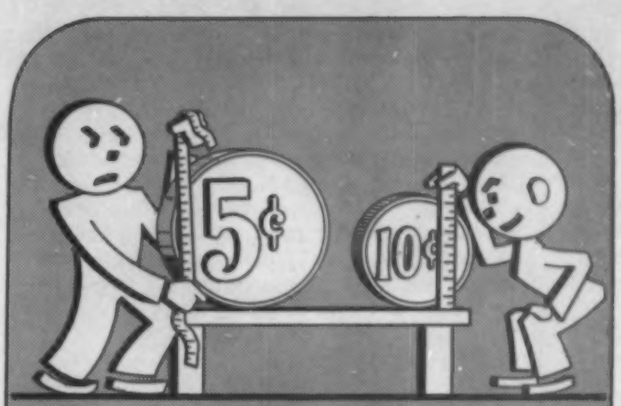
Thermometer pockets in hot plates for accurate temperature checking. Temperatures to 400°F. Unbelievably light—compact—weighs only 125 lbs. No setting-up necessary. One man can lift the entire press.

Standard accessories also provide for numerous other research problems—dehydration, extrusion, filtration, crushing, etc.

Thousands in use by industrial firms, colleges and government research centers all over the world.

Write for a complete Catalog

THE CARVER LABORATORY PRESS
FRED S. CARVER
HYDRAULIC EQUIPMENT
343 HUDSON ST., NEW YORK
In London **BAKER PERKINS Ltd.**



THE BEST ISN'T ALWAYS BIGGEST

THE true measure of value in comparing plastic molders should be equipment, ability, experience, and results.

Our moderate size enables us to personally supervise every job we undertake. The fact that we have yet to lose a customer proves that we are capable.

Whether you measure by experience, by ability, or on the basis of equipment, KILGORE is a name to keep in mind when you figure your next PLASTIC job.

Simply send us a sample, sketch, or blueprint and an estimate of your requirements. We'll appreciate the chance to submit our quotations.

PLASTIC DIVISION
THE
KILGORE
MANUFACTURING CO.
WESTERVILLE, OHIO

★ AT THE PLASTICS FORUM OF THE PACKAGING Conference of the American Management Association in Chicago, at the Stevens Hotel, April 1, 1941, B. F. Conner of Colt's Patent Fire Arms Mfg. Co. was the invited spokesman and Ben Nash, industrial Designer, acted as moderator. During the comprehensive discussion many phases of packaging were discussed. In answering questions on plastics, Mr. Conner emphasized the importance of industry cooperation. He said, "We are striving to bring about a cooperative institute. The industry has grown rapidly and there are so many varying elements that have entered the business they have not had time to know each other. They have not had time to have the experience in cooperative work. I think it is time now that such a step is taken."

In discussing price tendencies in plastics, Mr. Conner said that "if the plastics industry is going to grow as it should, it is without doubt going to look forward to higher prices throughout the whole industry."

Questioned on the availability of plastic materials, Mr. Conner stated: "In 1940 there was a 45 percent increase in tonnage of production in plastic materials in the country. That was to a great extent due to the sudden demand in this emergency program, which started quite some time before Mr. Stettinius spoke. It was well on its way then. This year we expect throughout the industry about a 50 percent increase over 1940.

"Now, I am just going to quote again. I am not going to stand up here and admit that there won't be plenty of plastics, because I am thoroughly convinced that there will be. In the Journal of Commerce and Commercial Bulletin of February 17, 1941, Edgar M. Queeny, of the Monsanto Chemical Co., in talking about our friends in Washington about priorities, etc., says the following: and this is the thing that I want to read:

" 'There are ample supplies of plastics compounds or the raw materials from which they are made, so that even abnormal demands can be satisfied quickly. Plastics can be successfully used to replace cast or stamped metals in a wide variety of large-scale uses. An excellent example is the growing use of molded plastics for housings of all types, notably for scales, business machines, radios, vacuum cleaners, and other appliances.' "

★ THE RESINOUS PRODUCTS & CHEMICAL CO. announce the availability of a new material, Plasticizer C-24. This material is a cyclic ketone, a derivative of isophorone of high molecular weight, intended for use as a chemical, or solvent type plasticizer for contings, plastics, cellulose derivative, etc., and as a softener for synthetic and natural rubber. It is said to be characterized by high plasticizing efficiency, chemical inertness, high boiling point, low freezing point and low vapor pressure.

Ersatz

★ A CHOICE BIT OF PROPAGANDA FROM NAZI GERmany has some rather interesting and enlightening "facts" on plastics. Quoting from this discourse which is entitled: *The Economic Strength of the New Germany*, we find the following:

"The oldest Werkstoff based on the synthetic resins, Bakelite, originated in a German factory. Bakelite is a purely German material produced from by-products of the distillation of hard coal and wood, phenol and formaldehyde."

This interesting statement was brought to the attention of Allan Brown, Advertising Manager of the Bakelite Corp., whose comment was:

"Replying to your letter of April 14, I should say that Dr. Karl Dorn's statement speaks for itself. Apparently the Germans have reached the point where they are using "**ersatz**" for facts."

Sorry!

★ IN ITEM NUMBER 1, OF PLASTICS IN REVIEW, ON page 46, of the April 1941 issue, the name of the manufacturer of the clear Lucite bath accessories was incorrectly spelled. These were made by Lurite Corp., 480 Washington St., Newark, N. J.

★ A GENERAL DISCUSSION ON THE SUBJECT OF plastics featured the monthly meeting of the American Designers Institute at the Architects League, New York, on April 16th. Morris Sanders, well-known designer and architect, read a paper on plastics, following which there was a general forum on the subject of plastic applications. Ben Nash presided.

★ PROMOTIONS IN TOP MANAGEMENT POSITIONS of Owens-Illinois Glass Co. and Owens-Illinois Can Co. have been announced by J. Preston Levis, president of the companies. Randolph H. Barnard, executive vice president, and Faustin J. Solon, vice president, will in the future devote their entire time to general management, production and sales problems. Garland Lufkin, who has been general manager of the Closure and Plastics Division, has been named general manager of the Glass Container Division. Ray R. Washing, plant manager of Glassboro, N. J., will come to Toledo to take over the position of general manager of the Closure and Plastics Division.

★ GITS MOLDING CORP. HAS APPOINTED C. N. Cahill General Sales Manager. Mr. Cahill was formerly the directing head of the Autopoint Co. of Chicago. Gits Molding Co. has recently completed a new addition to their plant, opened March 1st, to house a finishing department and storage rooms.

★ AN OPEN STOCK OF PLASTIC TUBING, AVAILABLE for immediate delivery in quantities ranging from 1 ft. to 10,000 ft. and in various diameters, has been announced by Julius Blum & Co., Plastics Shapes Div., 532 West 22nd St., New York City. Herbert R. Simmonds, consulting engineer and author of *Industrial Plastics*, has become affiliated with the company as technical consultant.

★ WE ARE INFORMED THAT THE BRIGHTON COPPER Works, 2159 Kindel Ave., Cincinnati, Ohio, is a general fabricator of vessel equipment suitable for use in the plastics industry.

★ A NEW GENERAL-PURPOSE PHENOLIC MOLDING compound is announced by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. This material is to be known as Durez 775 black and was developed to make available a material which would have a wider range of application than existing general-purpose materials, it is claimed.

★ PLASKON CO., INC., TOLEDO, ANNOUNCES THE addition of O. P. Clipper to the staff. Mr. Clipper, who leaves the Glidden Company, will assist in the development of urea formaldehyde resins for the paint trade, and will be associated with Dr. A. M. Howald.

★ DETROIT MACOID CO., DETROIT, MICHIGAN, announces the manufacture of continuous length thermoplastic divisional conduit by the extrusion method. This type of conduit permits the use of uninsulated wire and it is claimed that it is proving to be practical in airplane construction. Whereas it has been the practice to transmit electrical energy by one or more main cables in an airplane, now to afford additional safety in combat it is found desirable to distribute the current by more circuits. By so doing the hazard of having one damaged electrical circuit entirely destroy the operation of the plane, through wiring failure is reduced. Indications are that this divisional conduit will fit into this newly adopted wiring scheme well. It is said that the conduit has also been received with interest in the refrigerator and bus industries. It has a favorable weight strength ratio. Screw joints are not necessary in joining lengths together and it may be readily bent to conform to curved or rounded surfaces. It is produced in practically any length, the company reports.

★ ERIE RESISTOR CORP., ERIE, PA., ANNOUNCES the appointment of Harry R. Brethen of Detroit, as their representative for the State of Michigan.

★ BRIDGEPORT MOLDED PRODUCTS, INC., HAS PURchased the molding presses and molding equipment formerly used by the Plastics Division of the Gorham Company. Additional plant expansion is planned.

★ EVERETT GORDON, FORMERLY CONNECTED with the New England Novelty Co., Leominster, Mass., as production manager, is now associated with Gering Products, Inc., Rahway, New Jersey, in the same capacity.

★ IT HAS BEEN ANNOUNCED THAT THE ANCHOR Cap & Closure Corp., manufacturers of metal and molded closures and sealing equipment for their application, was liquidated and dissolved as of March 1st. All business, plants and property have been acquired by the Anchor Hocking Glass Corp. Henceforward, it will be known as the Anchor Hocking Glass Corp., Closure Division. Headquarters will be at Lancaster, Ohio.

★ JOSEPH STROSS HAS RESIGNED HIS POSITION AS buyer for the Crosley Corp., to accept the position of Purchasing Agent for The Metal Specialty Co., Cincinnati, Ohio. (above).

★ THREE EXHIBITS SPONSORED BY *MODERN PLASTICS* magazine have been touring the country. The first exhibit consists of the prize winners of the Fifth Annual Modern Plastics Competition and was on display in the lobby of the Department of Commerce Bldg., Washington, D. C., from December 15th to the end of March. The second exhibit includes some of these prize winners and another collection of miscellaneous plastic items. This exhibit spent the month of January in the Springfield Museum of Fine Arts, Springfield, Mass., and the month of February in the Institute of Modern Art, Boston, Mass. The third collection is a comprehensive group of miscellaneous plastic merchandise that traveled to the H. Sophie Newcomb Memorial College, Tulane University, New Orleans, La., for April. Another exhibit was held during the month of April at the Minneapolis Public Library, Minneapolis, Minn. The library sent out elaborate publicity releases, prepared spot announcements for local radio broadcasts and conducted a radio program on plastics which invited everyone to visit the exhibition. Attendance reports and the interest shown in all of these exhibits are excellent evidence of the public interest in new plastic products.

News and bookings of *The Magic of Modern Plastics*, our sound and color movie, appears on page 110.

Illustration courtesy Production Machine Co.

What Coated Abrasive Leads in Cutting Power? CLOVER, of Course!

Your machinist's knowing hands will quickly detect what other experienced users of Clover Coated Abrasives have known all along, — that grain for grain, Clover leads in sanding power! And why shouldn't it? Each tough-bodied grain is firmly embedded in the bond, business-end up for maximum cutting efficiency. The Clover coat is *all teeth*, — no "lazy" grains to result in dull, listless sanding effort.

TELL US YOUR TOUGHEST COATED ABRASIVE PROBLEM . . .
WE CAN HELP YOU!

Clover Abrasive Advisory Service is ready to help you, and make recommendations that will put your production on a profitable basis. Write DEPT. M for details. Ask also for informative Abrasive Manual, and for our free trial offer.

CLOVER MFG. CO., NORWALK, CONNECTICUT

ASK, ALSO, ABOUT CLOVER GRINDING AND LAPPING COMPOUND — FAMOUS FOR 38 YEARS

In the 38 years Clover Compound has been the first choice of expert machinists for precision lapping, over 40 million cans have been used,— each can demonstrating these long-famous Clover qualities • Perfectly graded, super-sharp, diamond-hard Silicon Carbide grain • Eight grades from microscopic fine to very coarse • Special heat-resisting petroleum hard oil binder • Withstands friction temperatures • Maintains uniform consistency and grain suspension • Fast-cutting • Cool-cutting • Does not burn work.

The trade mark that certifies abrasive quality

CLOVER
Coated Abrasives
Easily Identified by Color-Striping and the Famous Clover Trade Mark

QUALITY ABRASIVES SINCE 1903

Growth of plastics

(Continued from page 50)

The first type of plastic made from phenolic resin was invented in 1907. However, coal-tar resins in 1939 represented more than four-fifths of the total volume reported in pounds of plastics produced. This drift away from nitrocellulose plastics is partly indicative of a change in the use of plastic products, departing from the original ornamental uses toward the heavier industrial applications. Several decades ago plastics were throught of primarily for decorative uses such as imitation jewelry, toys, and mechanical pencils, while at the present time plastics are used to a much greater extent industrially in refrigerators, radios, automobiles, airplanes, etc.

The figures in Table 1 record the status of the principal types of plastics in their primary form. Comparable data on production of nitrocellulose or pyroxylin plastics are shown over a period of several decades. Marked increases occurred in the production of cellulose acetate from 2,874,819 lbs. in 1933 to

TABLE 2. CURRENT PRODUCTION SERIES ON SOME PRINCIPAL PLASTIC PRODUCTS: 1939–1940

	1940	1939
Nitrocellulose:[a]		
Pounds	11,915,290	13,373,172
Cellulose acetate:[a]		
Pounds	23,850,050	20,795,835
Pyroxylin spread on textile base:[b]		
Pounds	59,522,794	62,829,055
Plastic paints:[c]		
Pounds[1]	7,895,717	6,684,512
Value[1]	$560,662	$488,605
Lacquer:[d]		
Gallons[1]	47,969,129	42,782,431
Value[1]	$61,273,829	$52,533,012

[1] Data on Plastic Paints and Lacquer represent sales.
Source: U. S. Bureau of the Census, Current Inquiries—
[a] Cellulose Plastic Products.
[b] Pyroxylin Coated Woven Cotton Fabrics.
[c] Plastic Paints, Cold-Water Paints and Calcimines.
[d] Sales of Lacquer.

TABLE 3. PRODUCTION OF SPECIFIED PRODUCTS CONTAINING SOME PLASTIC MATERIALS: 1939

Industry	Products	Value of Products	Quantity
Fabricated plastic products, not elsewhere classified	Synthetic resins (phenolic, urea, vinyl, acrylate, etc.):		
	Laminated sheets, plates, blocks, rods, tubes, and blanks	$11,004,222	.....
	Other laminated products—		
	Gears, bearings, and other machine parts	2,808,650	.....
	Electrical goods	3,511,548	.....
	Other and not specified	3,322,524	.....
	Molded or cast products—		
	Electrical goods	7,565,449	.....
	Closures	2,422,050	.....
	Housings (for cameras, scales, radios, etc.)	2,485 733	.....
	Cigarette cases, compacts, vanity cases, and similar articles	866,552	.....
	Costume jewelry	708,831	.....
	Lamp shades and reflectors	347,614	.....
	Other and not specified	18,498,490	.....
	Cellulose compounds (nitrocellulose, cellulose acetate, etc.), housings (for radios, etc.), cigarette cases, compacts, vanity cases, and similar articles and those not specified	18,998,256	.....
	Casein or galalith products and soybean articles	173,932	.....
	Other plastic products	574,660	.....
Artificial leather and oilcloth	Pyroxylin-coated artificial leather	21,511,342	80,354,478 sq. yds.
Brushes	Toothbrushes with handles or backs of cellulose compounds and other materials	7,718,467	.....
	Toilet brushes with handles or backs of cellulose compounds	1,612,227	.....
Buttons	Buttons of cellulose compounds	1,156,859	824,884 gross
	Buttons of galalith	3,066,495	13,827,501 gross
	Buttons of synthetic resin	4,080,941	15,438,819 gross
Dental equipment and supplies	Denture materials, except rubber	1,411,805	.....
Games and toys (except dolls and children's vehicles)	Cellulose compound toys	542,671	.....
Millinery	Synthetic-textile trimmed hats (finished hats of visca, cellophane, artificial horsehair, rayon, etc.)	5,324,296	540,850 doz.
Mirrors and other glass products made of purchased glass	Laminated glass (principally safety glass)	40,395,225	.....
Ophthalmic goods (lenses and fittings)	Spectacle and eyeglass frames, mountings, and parts of Zylonite or shell, with or without metal parts	2,516,257	.....
Paints, varnishes, and lacquers	Plastic paints	805,736	10,131,652 lbs
	Synthetic-oleoresinous varnishes, straight or modified (100 percent synthetic resin)	29,333,650	23,472,584 gal.
	Nitrocellulose (pyroxylin) products:		
	Clear lacquers	17,477,529	13,749,586 gal.
	Pigmented lacquers	27,756,553	12,572,217 gal.
	Thinners	14,208,650	22,386,579 gal
	Lacquer bases and dopes	3,337,663	3,094,391 gal
	Other nitrocellulose products	1,526,736	.....
	Synthetic resin enamels (oil, straight, or modified)	42,847,935	21,340,328 gal.
Pens, mechanical pencils, and pen points	Cellulose compound mechanical pencils	4,461,132	153,004 gross
	Cellulose compoupd fountain stylographic pens	11,890,129	202,468 gross
Photographic apparatus and materials and projection equipment (except lenses)	Films (motion-picture and other, exclusive of X-ray films)	55,492,493	.....
	X-ray films	10,237,241	.....
Radios, radio tubes, and phonographs	Phonograph records and blanks—		
	Disk records not including electrical transcriptions	15,980,130	.....
	Electrical transcriptions	2,023,857	.....
	Other records and blanks	1,757,897	.....

Source: U. S. Census of Manufactures, 1939 Preliminary Reports.

"VITALLY ESSENTIAL METALS MUST BE CONSERVED FOR PRIMARY DEFENSE PURPOSES"

PLASTIC- The "STAND-IN"* that BECAME a STAR!

MANUFACTURERS REPORT INCREASED SAVINGS BY EXPANDING THE USE OF PLASTICS IN PRODUCTS

Plastics pinch-hitting for metals, in a great many cases have reduced material costs, minimized machining and processing time, and have achieved products more attractive and serviceable than the original.

★ DURABILITY—Plastic is tough, strong, resilient, and affords almost unlimited design possibilities.

★ INCREASED BUY-APPEAL—Plastic with its many attractive colors and natural lustre is a top ranking salesman.

★ Leading manufacturers have called upon the experience and ample facilities of Kurz-Kasch to put plastic to work—profitably—in their products.

★ Many non-defense industries look to plastics to relieve metal shortages and whether you need to revise a present application or substitute for metals normally used, we offer our services.

*One who substitutes for a leading player

Kurz-Kasch, Inc. DAYTON, OHIO

Branch Sales Offices: New York, Chicago Detroit, Los Angeles, Dallas, St. Louis, Toronto, Canada. Export Office: 116 Broad Street, New York, New York.

ONE OF THE LARGEST EXCLUSIVE MOLDING PLANTS IN AMERICA

MONEY FOR YOUR PLASTIC SCRAP

As pioneers in the

Thermoplastic Scrap Materials

business we have been known throughout the land for many years as dependable dealers. We buy, reclaim, grade, grind, clean, and sell. No quantity too large or too small. We deal in: Celluloid; Acetate; Styrene; Acrylic; Vinyl Resins; Sheets; Rods; Molding Powders; etc. Try us *once* and you will make us your *Headquarters*.

Fill in, Clip, and Mail

Gering Products, Inc., Rahway, N. J.

Without obligating us in any way we shall be glad to receive an offer from you on the following Plastic Scrap:

.....lbs. of.....

Name.....

Firm.....

Street.....

City.....State.....

AVOID HIGH PRESSURE REDUCING VALVE TROUBLES

Here is a High Pressure Reducing Valve that handles working pressures up to 6000 pounds, without shock. Many of the leading plastics plants are using it and are well pleased with its performance. It is known as

ATLAS Type "E"

Forged Steel Body. For oil as well as water and air. Truly modern in every respect. Internal metal parts entirely of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure.

We make regulating valves for every plastics plant service. See partial list in the coupon below.

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

277 South St., Newark, N. J.

Representatives in Principal Cities

ATLAS VALVE CO., 277 South St., Newark, N. J.

☐ Please send complete information on the Atlas High Pressure Reducing Valve for plastics plants. Also, please send information on the following Atlas products.

☐ Campbell Boiler Feed Regulators
☐ Damper Regulators
☐ Temperature Regulators
☐ Reducing Valves
☐ Exhaust Control Systems
☐ Pressure Regulators
☐ Pump Governors
☐ Float Valves
☐ Humidity Controllers
☐ Thermostats
☐ Balanced Valves
☐ Control Valves
☐ Oil Control Cocks

Write your name, firm, and address on the margin of this page, tear out with this ad., mail, and you will hear from us promptly.

20,280,171 lbs. in 1939, and in the production of coal-tar resins from 41,556,515 pounds in 1933 to 152,121,989 lbs. in 1939. Phenol and cresol resins constituted the largest single type of plastics reported to the Census of Manufactures for 1937, amounting to 89,944,210 lbs., valued at $16,762,554. Although census figures on phenol and cresol resins are not available as separate data prior to 1935, statistics from U. S. Tariff Commission Information Series No. 31 showed production of 4,659,680 lbs. of synthetic phenolic resins valued at $3,410,179 as early as 1920. While production of phenol and cresol resins gained almost twenty-fold between 1920 and 1937, the average price per pound declined from 73 cents to 19 cents.

The Census Bureau collects monthly production figures on cellulose plastics and on several types of fabricated plastic products, which provide information subsequent to the 1939 Biennial Census. Table 2 shows annual production data in 1939 and 1940 for nitrocellulose, cellulose acetate, pyroxylin spread on textile base, plastic paints, and lacquers. The current figures show further declines between 1939 and 1940 in the production of nitrocellulose whereas a substantial gain in production occurred in cellulose acetate in 1940 compared with 1939.

This upward trend in production of plastics reveals only one aspect of its growth, the other phase being the fanlike horizontal spread of the uses of plastics reflected in the figures of a wide range of industries in the 1939 Census of Manufactures. The impressive multiplicity of products to which plastics contribute an essential part is shown in Table 3, ranging from adhesive plasters to safety glass, from lacquers to rayon yarns, and from phonograph records to millinery.

Even this array representing several hundred million dollars worth of fabricated products containing plastic materials is incomplete, owing to the classification of products used on census schedules. For example, it is a well-known fact that plastics are used in considerable quantities in telephones and radios, but the 1939 Census of Manufactures does not reveal separate data for plastic products incorporated in these major articles. Similarly, plastics are used in automobiles for steering wheels, horn buttons, gear-shift balls, etc.; in electrical sockets and switches; for grocers' scales; for airplane fabrics and propellers, but the Census of Manufactures does not record separate statistics on the quantity and value of plastic fabricated into these products. Plastics are used incidentally or as a minor factor in many other products, but Table 3 is intended to represent only articles in which it is definitely known that plastics contribute a material part.

The first section of Table 3 consists of data from the industry on "Fabricated Plastic Products Not Elsewhere Classified," which are shown separately at the beginning of the table, since this industry constitutes a secondary stage in production of plastics. Basic plastic materials are shown by the Census of Manufactures in the Plastic Materials industry; articles fabricated almost entirely from plastics are classed in the industry for Fabricated Plastic Products Not Elsewhere Classified; while finished manufactured articles partially utilizing plastics are recorded in the other 13 industries listed in Table 3.

The use of plastics has thus spread to many industries since 1869 when a plastic billiard ball was first invented as a substitute for ivory in a competitive prize contest. The greatest growth in plastics has occurred since 1933, the production of pounds of plastic materials trebling between that year and 1939. Evidence for 1940 shows continued growth and plastics are making further gains in many uses for National Defense.

Medical demonstration torso

(*Continued from page 61*) detail. Plastics offered the only possible means of overcoming all of these difficult problems.

The coloring was done in oil paint, protected by clear lacquer, and the various organs have been very realistically reproduced. The outer skin surfaces, which are shown, very closely resemble natural epidermis in appearance, both as to coloring and that certain translucent quality which is virtually impossible to obtain in plaster.

The front part of the model is comprised of a double-walled water-tight container which carries out the contour of the outer surfaces of the lower wall of the chest and abdomen. Built into the lower section of this part are the accurately formed reproductive organs with which this test is primarily concerned. These organs are molded of cellulose acetate. The entire front section is built of clear transparent vinyl resin sheet. There are transparent hooks at the sides for fastening the frontal section to the back panel.

Lightweight and easy to carry, the model is, however, so strong and durable that ordinary knocks will not damage the surface or the material itself. This is in contrast to the plaster anatomy models in general use which, besides being very heavy, are extremely fragile. There is a compact folding arrangement on the back of the display panel which makes for easy setup and supports the model at exactly the correct angle. A small hinged door on the back of this panel provides easy access and free ventilation for the light which illuminates the interior of the anatomy. When this door is closed, the lamp and brilliant chromium reflector fit inside the hollow form of the organs. When open, the light is supported so that the reflector focuses a concentrated spot of light into the Uterotubal section.

In use the clear front wall container of the model is filled with a transparent colorless liquid. A gas, introduced under carefully regulated pressure, issues from the ends of the plastic Fallopian tubes, and bubbles through the liquid, up along the surface of the exposed organs to the top of the transparent wall. When sufficient pressure has been reached, this gas escapes through a diaphragm arranged at the top of the vinyl

The *Jockey* or the *Legs?*

It might be the rider or the horse's physical condition or just the oats he ate for breakfast that won the race. The only *sure* way to come out on top is to have every contributing factor in the best possible condition. That's why so many leading manufacturers come to us for their plastic moldings. They know we have the equipment (both compression and injection), the personnel, the plant and the experience to give them winners every time.

American Insulator Corp.

Plant • NEW FREEDOM • PENNSYLVANIA

SALES OFFICES:

BOSTON · BUFFALO · CHATTANOOGA · CHICAGO · CLEVELAND · DETROIT · LOS ANGELES · ST. PAUL · STRATFORD · NEW YORK · PHILADELPHIA · ST. LOUIS

Molding-of-the-Month
Compression molded black Phenolic handles for side and top of Belle Brilliant Sauce Pot for Everedy Company, heat-resisting and sturdy.

3 PYROMETERS IN 1

Provided with readily interchangeable thermocouples, the Cambridge Combination Pyrometer may be used for checking temperatures of still or moving rolls, mold cavities or temperatures within the mass of material. This is a sturdy, accurate and dependable instrument for shop as well as for laboratory use. Single purpose pyrometers also available.

Send for descriptive literature

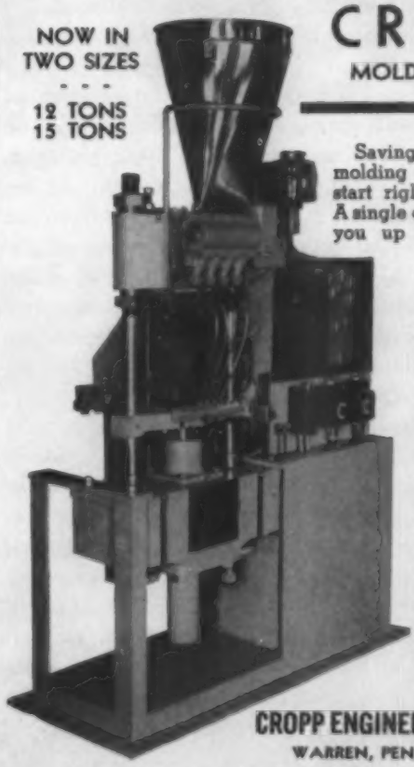
CAMBRIDGE INSTRUMENT CO., INC.
3732 GRAND CENTRAL TERMINAL
NEW YORK, N. Y.

CAMBRIDGE
COMBINATION PYROMETER

CUT YOUR MOLDING COSTS
WITH THE AUTOMATIC, SELF-CONTAINED

CROPP
MOLDING PRESS

NOW IN TWO SIZES
• • •
12 TONS
15 TONS



Savings in compression molding on CROPP presses start right with the molds. A single cavity mold will give you up to 1400 pieces a day, 9800 a week, 42,000 a month.

Perfect pieces produced consistently because powder is accurately measured and delivered into the mold without waste. Every operation in each cycle timed to the second.

Less than $1 for electric current runs and heats the press for a full 24 hour day on many jobs.

Write today for folder giving complete details.

CROPP ENGINEERING COMPANY
WARREN, PENNSYLVANIA

section. The diaphragm is made of pure gum sheeting and represents the action of the diaphragm in the human system.

By tilting the torso, it is possible to cause the bubbles to emerge from either the left or the right Fallopian tube. Bubbles escape from one tube as a rule, but can be made to escape from the other also by increasing the pressure or speed of the gas flow. Should the tubes be obstructed, the test indicates whether the obstruction is in the left or the right tube. It has been found that in many cases the obstruction may, by this test, be corrected without resorting to surgery.

The pressure and recording apparatus used in conjunction with this display model is identical with that used in the test performed with human subjects.

A two-piece vulcanized fiber carrying case was designed to reduce the weight to a minimum. This case itself is light yet strong enough to withstand years of handling and to provide protection for the plastics.

With the usual supply of anatomy models from abroad sharply curtailed by present conditions, it is likely that domestic craftsmen will be called upon more and more to produce and improve upon the older types by employing such modern materials.

Credits: Monsanto cellulose acetate, Vinylite; fabricated by The Displayers.

Improved injection mold design

(Continued from page 77)

In this type of mold construction the nozzle extends through the stripper plate and the tapered tip of the nozzle seats in the tapered bore of the air channel plate. The sprue has an enlarged portion at the tip of the nozzle with a diameter greater than that of the nozzle tip, to allow the air channel plate to strip the sprue from the nozzle.

The stripper plate (5) is fastened to the air channel plate (7) and the two plates move in unison, when the mold is opened. The movement of these plates is limited by the heads of the stripper screws (8). At the end of this movement the molded parts are cut from the runners by a shearing action between the top of the stripper bushing (6) and the cutting edge (16) of the mandrel (9). When the mold opens to position shown in Fig. 2, the molded pieces are forced from the surface of the stripper plate by air entering through the air passage (17).

The mold shown is only one example of this type of mold construction, as pieces of various shapes and sizes may be molded by the method described after a slight change in the mold design from the example shown. This type of mold makes it possible to produce a molded and trimmed piece in time formerly required for molding the piece. The advantages of this type of mold will be readily apparent to the experienced molder. This method permits the production of a molded piece having a flawless outer surface and a cleanly trimmed inner surface without any additional machine time, and with only a nominal increase in the mold cost.

Plastics at A.C.S. meeting

(Continued from page 76)

The resinous ion-exchangers offer the following advantages: high capacity, high exchange velocity, excellent stability, both mechanical and chemical, to acids, alkali and heat, uniformity of quality, low operating costs, freedom from "leakage" of ions being removed, wider fields of application.

The resinous ion exchangers may be used in the softening of water for industrial, municipal, and domestic use. They may be used in the partial or complete removal of dissolved salts from water, sugar solutions, protein solutions, biological and pharmaceutical media. They are of value in the recovery of traces of copper and other valuable metals from dilute solutions, and in the removal of iron and objectionable acids from waters and industrial products, such as enzyme extracts, dyestuffs, pigments, sugar solutions, pharmaceutical preparations, etc. Other applications undoubtedly await the mere application of this new tool.

ADSORPTION ISOTHERMS OF SYNTHETIC RESIN ION-EXCHANGE ADSORBENTS. R. J. Myers, J. W. Eastes, and D. Urquhart, Resinous Products and Chemical Co.

The adsorption and exchange process has been considered as a species of chromatographic adsorption, with bands of exchanged ions proceeding down the column. The analysis of the problem indicated that the "break-through" capacity of an adsorption column should be predictable from a knowledge of the adsorption isotherm of the adsorbent being used. Many synthetic resins were prepared and the adsorption isotherms determined under conditions which simulated those in the column. Adsorption runs were made simultaneously in the columns with the same resins. The correlation between the observed and the calculated "break-through" capacities is very good. Some resins show a marked dependence of capacity upon developed surface, indicating a hard, impervious structure. Other resins show no dependence of capacity upon developed surface, which is interpreted as indicative of a porous gel structure. Certain preparations also show no concentration effect, which has been interpreted as chemical reaction alone. The Freundlich adsorption isotherm fits the experimental data. Direct visual observation of chromatographic banding has been noted in certain resins. The adsorption method developed has been found convenient for rapid evaluation of new resins, although other factors may be of equal importance in the application of an exchange absorbent.

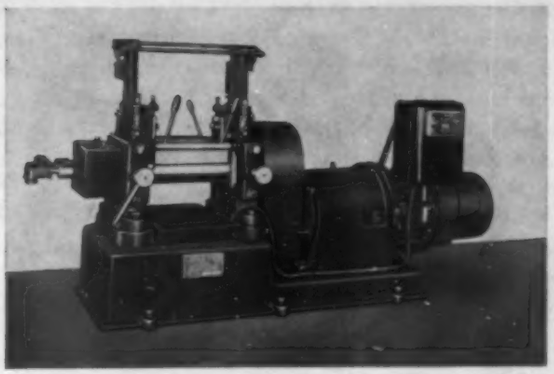
OPERATING CHARACTERISTICS OF SYNTHETIC RESIN ION EXCHANGES IN WATER PURIFICATION. R. J. Myers and J. W. Eastes, Resinous Products and Chemical Co.

A variety of materials for ion-exchange has been disclosed in the literature. Thus, cation-exchangers prepared from sulfonated coal, lignite, peat, phenol-formaldehyde resins, and tannin-formaldehyde resins, as well as anion exchangers prepared from aniline-black, aromatic polyamines, and aliphatic amines have been described.

An extensive research was made, during which various types of synthetic resins were prepared and examined for ion-exchange properties. Two resins were selected for detailed study, one a cation-, the other an anion-exchange resin.

To study the operating characteristics of the resins, an apparatus was designed which consisted of a 4-in. glass tube, with rubber-lined connections and fittings. The synthetic ion-exchange resins were found to have several advantages over the older exchange adsorbents: they are nonsiliceous, stable to both acids and alkalies, insoluble in organic solvents, stable to hot and cold solutions, capable of being operated at high rates of flow with low pressure drop, and they have high capacities and operating efficiencies. The cation-exchanger adsorbs all metallic ions, such as alkali and alkaline-earth metals, copper, iron, mercury, ammonia, etc. The cation-exchanger may operate in the

A MINIATURE MIXING MILL
FOR PRECISION
RESEARCH - LABORATORY EXPERIMENTS



A 3″ x 8″ MINIATURE LABORATORY MILL

For Table Mounting and Incorporating All the Features of Production Equipment.

This Mill Provides the Chemist with a Precision Machine to Meet His Exacting Requirements Yet Permitting Him to Use a Minimum of Compound for Each Experiment.

Write for Prices and Specifications

Wm. R. Thropp & Sons Co.
TRENTON, N. J. **EST. 1888**

Attleboro DOMINATES THE AIRWAVES

The new molded cabinet for the table-model Emerson radio marks another in the chain of successful large-scale cabinet production jobs turned out by Associated Attleboro.

The case is a perfect example of the molder's art. Molded complete in one piece, it incorporates "strong points" for assembly, a number of three-dimensional design effects and a fine, smooth finish direct from the mold.

We are especially geared for the long-run production of large moldings in phenolic and urea materials. We have the presses, the toolmakers, the engineering personnel to handle these orders economically and satisfactorily.

ASSOCIATED ATTLEBORO MANUFACTURERS, INC.
New York Office: 303 Fifth Ave.
ATTLEBORO, MASS.

Molded by Stokes

There's 42 years of experience that go into every piece Molded by Stokes . . . **That** should weigh heavily in your choice of a molder. We're close to raw material sources—which helps cut down molding costs—a saving shared by our customers. Our engineering and designing staffs produce smart, modern, practical designs, and are available for creative work or consultation. Ample reserve equipment and excellent transportation facilities enable us to assure unexcelled production and delivery service.

PHENOLS
UREAS
STYRENES
ACETATES
Other Plastics
and
GENUINE HARD RUBBER

JOSEPH STOKES RUBBER CO.

Gen'l Offices: 322 WEBSTER ST., TRENTON, N. J. Plants: TRENTON, N. J. and WELLAND, ONT.

MOLDERS OF ALL PLASTICS—Including Hard Rubber—SINCE 1897

usual sodium cycle, or in the hydrogen cycle, in which case it reduces the total solids of solutions by replacing all cations by hydrogen. The anions are converted to free acids which may then be removed by the anion-exchanged, or acid-adsorbent resin. The resultant effluent is a "distilled water" which is of high quality and often is superior to ordinary laboratory-distilled water.

Complete regeneration and ion-adsorption curves were mapped out for the resins. Studies were also made on the pressure drop across the bed, rates of flow, bed expansion, washwater requirements, effects of strength of regenerant solutions, speed of regeneration, methods of regeneration, effect of water hardness on capacity, etc. The results have been compared with the published data on the older types of exchange adsorbents.

METALLIC COPPER ANTIFOULING PAINTS. S. B. Tuwiner and D. A. Dodge, Phelps-Dodge Corp.

Pure electrolytic copper bronze paste was combined with oleoresinous varnish vehicles based on coumarone-indene and allied resins fortified with a 100 percent paraphenyl phenol for maldehyde resin, and also with an unmodified, heat reactive phenolic. Panels coated with these compositions were exposed off the Florida Coast. Results show the best compositions tested were one containing a 6-gallon tung oil varnish the resin of which consisted of 75 percent dark-colored coumarone indene resin–25 percent paraphenyl phenol, and one containing a 4-gallon tung oil varnish, the resin of which was 100 percent dark-colored coumarone indene.

The first of these compositions was tested on the hull of a commercial freighter and found to have practical merit. Durability is a function of the primer as well as the top coat, and the selection of the former is extremely important for this type of antifouling paint.

Plasticity of mold compounds

(Continued from page 74)

It is well known that the plasticity of some of the molding compounds, by whatever method measured, is substantially affected by the moisture content of the powder. The effect of moisture on moldability is similarly well known to the molding trade. In Fig. 5 data are given illustrating this important effect. The materials covered are a high flock phenolic, a standard wood flour phenolic, a urea, and a cellulose acetate. Samples of polystyrene exposed to 90 percent relative humidity for 14 days showed no change in plasticity because of the low moisture absorption of this material.

Since reproducibility depends, among other things, upon the diemakers' ability to duplicate the apparatus itself, it is of interest to compare capillary diameters in different dies. Table II gives the dimensions for three dies, two made by the same shop and the third by an entirely separate organization. Barring other factors such as mold poisoning or poor control of pressure or temperature, the spread of values of plasticity index obtained with the three dies should not be greater than the whole number 2.

TABLE II.—COMPARISON OF CAPILLARY DIAMETERS IN THREE PLASTICITY MOLDS

Molds 1 and 2 Made in Same Shop

	Capillary Diameter, in.						
Mold	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
No. 1	.0920	.0770	.0631	.0466	.0320	.0220	.0156
No. 2	.0940	.0768	.0613	.0453	.0300	.0187	.0147
No. 3	.0925	.0767	.0620	.0457	.0301	.0192	.0146

In the use of this die a convenient method of determining empirical "flow times" for thermosetting compounds consists of mounting a dial gage between the upper and lower platens of the press. Measurement by stopwatch is made of the elapsed time from the instant the pressure gage registers 4 tons until the hand of the dial gage stops moving. For commercial phenolics this is usually in the neighborhood of 25 secs. The dial gage also furnishes interesting information on flow-velocity characteristics of thermoplastics.

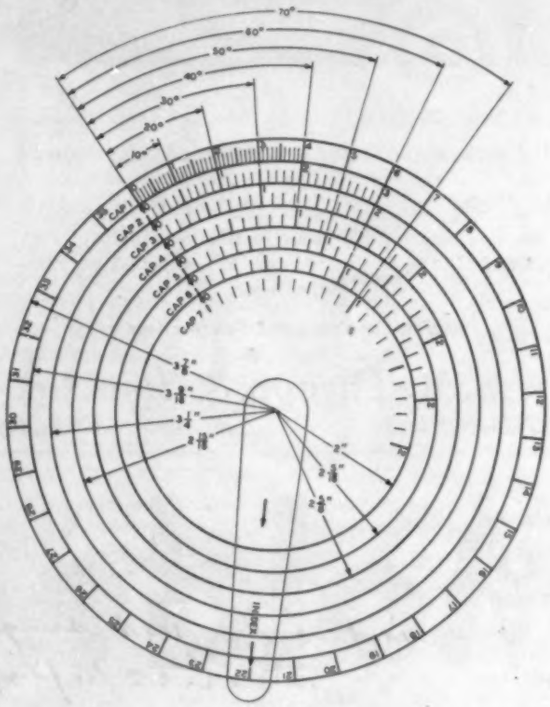


Fig. 6

A slide rule has been designed to expedite the calculation of plasticity index and minimize the possibility of error. It consists of 7 concentric disks, each one graduated in divisions corresponding to tenths of an inch filament length, making it possible to estimate hundredths. The calibration is such that the multiplying factor for each filament is implicit in the scale. In use, the zero line of the No. 2 disk (corresponding to the No. 2 filament) is set opposite the No. 1 reading, the zero of the No. 3 disk opposite the No. 2 reading, and so on, with a radial pointer set at the No. 7 reading on the inner disk and indicating simultaneously the Plasticity Index on the outer (No. 1) disk. It is illustrated in Fig. 6.

The simple design and construction of this apparatus as well as the method are important features of this flow determination system. The charts clearly indicate the results obtainable, both for thermoplastic and thermosetting materials. Inexpensive, effective, the method can be adapted to laboratory work or may be used for production control.

BARCO REVOLVING JOINTS

Reduce Maintenance Costs on Revolving Drums and Dryers

Type 7R-BCR with adapter.

Send for catalogue 292.

Ball seats permit flexibility to eliminate piping strains.

To convey air, oil, gas, steam and other fluids from a stationary to a rotating member without leakage.

Barco Manufacturing Co.
NOT INC.
1809 Winnemac Avenue
CHICAGO, ILL.
In Canada, The Holden Co., Ltd.

HERE'S HOW YOU CAN GET *Closer* TEMPERATURE CONTROL

Wheelco "RADIO PRINCIPLE" Control

CAPACITROL
Available in Scale Ranges between 0 and 3600°F. or equivalent °C.

If you are interested in closer control of your plastic molding temperatures, consider these important points:

1. Wheelco Indicating Controllers provide the greatest possible accuracy of temperature measurement.
2. Wheelco "Radio Principle" Controllers are actuated by the slightest deviation from temperature control point. Control action is instantaneous.
3. There is no interlocking between temperature measuring and temperature control sections.

No other instrument can give you all of these features. Compare Wheelco Controllers with any other type of temperature control and let the results speak for themselves.

Write TODAY for your free copy of Bulletin No. D2

Wheelco Instruments Co.
1929-33 S. HALSTED STREET • • • CHICAGO, ILLINOIS

Speaking of VACUUM IN PLASTICS

The CRESCENT VACUUM PUMP *will* REDUCE *waste* INCREASE *production*

Patented

Here are 7 EXCLUSIVE FEATURES

1 Continuous high vacuum.
2 Air cooled—no water used.
3 Self sealing—no liquids required.
4 28" to 29" laboratory vacuum.
5 99% volumetric efficiency.
6 FEWEST moving parts.
7 Runs years without repairs.

The CRESCENT Roto-Piston Dry Vacuum Pump has saved thousands of dollars for many. It will eliminate burned spots, porosity, weldlines, shrinkage, bad finish or failure to fill properly. It will give you a cycled laboratory vacuum of about 29" in the plastic injection molding die cavity. The CRESCENT Vacuum Pump will reduce waste and rejects. It has licked many molding problems. WHY NOT FIND OUT WHAT IT WILL DO FOR YOU.

● *Installation details will be mailed upon request* ●

VACUUM SYSTEMS, INC.
1053 Power Avenue · Cleveland, Ohio

CONTINUOUS HIGH VACUUM!!

CONTRACT AND CUSTOM
PLASTICS MOLDING
FOR THE TRADE

INJECTION MOLDING
A SPECIALTY
●
Ask us for QUOTATIONS on your requirements. No obligation.
WRITE TODAY

S. S. WHITE

The S. S. White Dental Mfg. Co.
INDUSTRIAL DIVISION
PLASTICS DEPARTMENT M
10 East 40th St., New York, N. Y.

Plastics go to the people

(*Continued from page 49*)

have been designed for exterior use on window poles and outside the building, and also within the store.

Manufacturing demonstrations—souvenirs

Plastics in the making—and a sample to take home! The perfect tangible reminder of America's Modern Plastics Exposition, miniature cameos inscribed with the insignia and legend of the Exposition, are molded at scheduled demonstrations on a small, electrically operated Carver laboratory press. The processing technique is typical of the thermosetting principle of molding, and the machine, although hand operated, is actually used for small-scale commercial production. The operator need not be experienced; full written instructions are provided. A capable store employee is trained to operate the press and deliver an informative commentary. The souvenir, made of non-inflammable molding powder, is made in 2 minutes—long enough for the demonstrator or lecturer to explain every detail of operations.

Exposition supervisor

A gala week of activity, America's Modern Plastics Exposition is organized to develop the ultimate in promotional and merchandising opportunities for retailer. Smooth running efficiency is assured by a competent, experienced promotion executive who will train store individuals in conducting motion picture performances, explain the operation of the laboratory molding machine, deliver lectures on preserved specimens and other Exposition features before schools and clubs. Every effort to assist store officials and personnel to a more thorough understanding and knowledge of plastics, and to help them make the Exposition a spectacular, memorable success will be made. The aim of this amazing exhibit is to make plastics understandable to the consumer market—a fact which will influence the sale of plastic merchandise throughout the store.

The big show is going to town—and from every town in the United States, consumers are ready to greet it. Right on their home grounds, America's Modern Plastics Exposition is off to meet the people.

Soybeans in plastics

(*Continued from page 71*) of the various samples is illustrated. It is seen that where 60 percent wood flour is used instead of 50 percent, the setting time is increased at all temperatures. This observation may be attributed to the low heat conductivity of the wood flour. However, the slowing down of the cure when hardened soybean meal is used must be attributed to a negative catalytic effect of protein on polymerization of the phenolic resin.

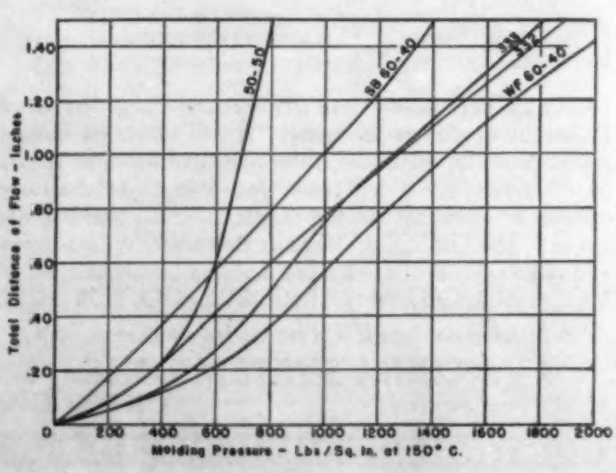
Pressure characteristics

The total distance of flow which a sample attains at a fixed pressure and temperature may be called a property of the material, but it is not a very informative property because, for any molding material, a pressure and temperature may be chosen to give the same flow distance as that of another molding material used for comparison. A more fundamental property may be obtained by determining total distance of flow at a series of different pressures and then drawing the distance-pressure curves.

TABLE II. PRESSURE-DISTANCE DATA FOR MOLDING COMPOSITIONS CONTAINING VARIOUS PROPORTIONS OF SOYBEAN MEAL, PHENOLIC RESIN, AND WOOD FLOUR

Pressure	Flow Distance, In.				
Lb./Sq. In.	WF-50-50	WF 60-40	SB 60-40	333	332
200	0.08	0.04	0.17	0.05	0.08
400	0.23	0.12	0.38	0.13	0.23
600	0.61	0.22	0.57	0.28	0.42
700	1.06				
800	1.47	0.37	0.80	0.50	0.61
1,000		0.56	1.01	0.75	0.77
1,200		0.76	1.23	0.95	0.94
1,400		0.96	1.50	1.12	1.11
1,600		1.16		1.30	1.26
1,800		1.28		1.48	1.43
2,000		1.42			

In Table II is recorded the distance of flow obtained from the various samples using successive increments of pressure. These tests were run at 150 deg. C. The distance recorded is the amount of flow observed when the material sets up or stops flowing. These results are presented graphically in Fig. 7. Sample 50-50 gives an exponential type of curve indicating a yield pressure and a curved transition region which traces the behavior of the material at pressures in the vicinity of the yield pressure. Sample WF 60-40 shows some relationship to sample 50-50, while sample SB 60-40 gives almost a straight line, indicating that the soybean meal resin mixture has higher heat conductivity than the wood



1911 1941

30 YEARS' EXPERIENCE

in the Manufacture of Dies and Molds for Plastics

Specializing on:

INJECTION MOLDS

For use in all makes of injection molding machines and for all types of materials.

LESTER INJECTION Molding Machines N. E. Agents

BALL & JEWELL Plastic Scrap Grinder N. E. Agents

PARKS-STANDARD Acetate Dryer U. S. Agents

Standard Tool Co.

CONSULTANTS • DESIGNERS • BUILDERS

75 Water Street Leominster, Mass.

ACETATE · BUTYRATE
POLYSTYRENE
METHYL METHACRYLATE

INJECTION MOULDING

NOW OUR DIE SHOP

is in position to immediately handle dies of simple nature, or small hobbed areas.

- PROMPT QUOTATIONS
- EFFICIENT WORKMANSHIP
- LATEST EQUIPMENT

MINNESOTA PLASTICS CORPORATION

411 BROADWAY ST. PAUL, MINN.

YOUR PLASTICS WILL BE STRONGER WHEN YOU USE L-O-N-G COTTON FILLER!

IMPACT strength, tensile strength, flexural strength, compressive strength are all increased by ascertainable percentiles when the plastic is filled with Claremont long cotton flocks. That is the basic reason why well over 25,000,000 pounds of Claremont fibers have been used by the U.S. plastics industry in the last 20 years. Don't skimp on your filler. Use the best, use Claremont.

Claremont Waste Mfg. Co.

Claremont New Hampshire

The Country's Leading Makers of Cotton Flocks

Capacity 150-250 lbs per hr

MODERN SCRAP GRINDER for Modern Plastics

Ideal "Standard" model is a fast, efficient, economical scrap grinder. Portable, occupies 50% less space than old fashioned models of equivalent capacity (150–250 lbs. per hour). 7 solid tool steel knives, three interchangeable screens (more available) with 25% increased area. 2-belt Texrope drive, 2 H. P. motor for low-cost operation. Positive end seals. Write for FREE catalog of this and 11 other models.

BALL and JEWELL

20 Franklin St. Brooklyn, N. Y.

Since 1895, Manufacturers of Patent Rotary Cutters

or get in touch with nearest representative

NEW YORK: Alsing Engineering Co., 111 Eighth Ave., DETROIT: J. C. Austerberry's Sons. CHICAGO: Nell, Kohlbusch & Bissell. NEW ENGLAND: Standard Tool Co., Leominster, Mass. ST. LOUIS: Larrimore Sales Co. LOS ANGELES & SAN FRANCISCO: Machinery Sales Co. LONDON, ENGLAND: Blackfriar's Engineering Co., Ltd.

flour mixtures and that it is quite stiff. In other words, the flow is almost directly proportional to the pressure. Samples 333 and 332 give intermediate curves as would be expected because they contain both wood flour and hard soybean meal in admixture with phenolic resin.

Summary

1. Preheat curves are given for soybean-phenolic plastics and compared with curves for ordinary phenolic compositions.
2. The influence of soybean meal on the setting time of a phenolic type plastic is illustrated.
3. Distance-pressure curves show the effect on flow of modifying a phenolic type molding material with hardened soybean meal.

Complete plastic contact lens

(*Continued from page 55*) Artisans who do this work must be master craftsmen. The delicate task of polishing them had been an almost unsurmountable obstacle standing in the way of perfect production of all-plastic contact lenses until cast phenolic polishing laps were developed for this purpose. These are used with polishing agents of various kinds. The gradations of fineness depend upon the specific phases of the polishing operation involved. By employing this method, surfaces may be polished on methacrylate contact lenses the equal of any glass type.

Early experiments with contact lenses were to protect the eye from infection rather than to improve poor vision. Sixty years after Herschell, in 1887, F. E. Muller, a European, made a thin blown glass device for one of his patients suffering from inflammation of the cornea due to inability to close the lids as a result of a cancerous condition. The report states that the patient continued to wear this protection for several years.

The first great stride in contact lenses was made in 1888 by Dr. A. Fick, a European, who saw the possibilities of the "glass shell" for correcting poor vision. He made these molds from cadaver's eyes over which contact lenses were blown.

Ernest Abbé, an associate of Carl Zeiss, ground the contact lenses for Fick. In that same year Muller made contact lenses to improve his own myopic vision!

In 1892, Fick worked with Sulzer on contact lenses and made improvements that encouraged experiment by other. In 1909 the Muller firm of Weisbaden, Germany, produced a blown type of contact lenses from "glass eye" glass, which was a decided improvement.

In 1920 Carl Zeiss accurately ground and polished contact lenses of chemically resistant glass, and in 1929 a German eye physician demonstrated the practical application of contact lenses for correcting nearsightedness, and astigmatism. In 1932 the Zeiss firm appeared with two new improvements in contact lenses. In 1933, J. Dallos, a Hungarian eye physician, solved the problem of adding high corrective powers to any desired contact lens.

A combination of glass and plastic was perfected several years ago by William Feinbloom in cooperation with Schwab and Frank and Optical Research, Inc. (See MODERN PLASTICS, November 1939, page 72.) The corneal portion of the Feinbloom lens is made of glass, ground and polished, and the scleral portion is plastic. The use of a molded plastic for the rim made it possible to economically manufacture the lenses with rims of sufficient variety of size to fit a large percentage of eye demands.

The completely plastic lens by Obrig, methyl methacrylate throughout, which has been described in these pages is the latest development in contact lenses.

Psychologically the effect of well-fitted, comfortable contact lenses to people in public life is obvious. They can appear on the stage or screen, concert hall or pulpit, secure in the knowledge that their vision is perfect and their appearance unmarred by unsightly glasses. It is a boon to debs and dowagers alike with a strenuous social life to pursue, as well as occupationally for ship's officers, yachtsmen, engineers and all those workers in fields where rain, snow or dust cloud the eyeglass when important work is to be done. Breakage is almost non-existent and the contact lenses are claimed to be superior to spectacle lenses because it is optically impossible to obtain equally good vision over the entire surface of a lens placed 12 mm. or more from the eye. This is said to be especially true in the case of high refractive errors in which there is some distortion about the edge of the correcting lens limiting the field of vision.

Movie directors working in technicolor have found the contact lenses opening up a new field of realism. There is no need to switch brown-eyed leading ladies when the script calls for a blue-eyed ingénue.

Walter Hampden is fond of telling the story about himself and how he became "Great Bear," the brown-eyed Indian of Paramount's "Northwest Mounted Police" several years ago. Cecil B. DeMille wanted him for the role, but not as a grey-eyed Indian. Brown-eyed contact lenses obtained in a month saved the part for Mr. Hampden.

The successful manufacture of all-plastics lenses is a major opthalmological achievement, and one in which the remarkable properties of the plastic material plus technical skill are combined for satisfactory results.

London letter

NOW that the Lease and Lend Bill is law British business men are busily speculating as to the possible effect of large imports of American war materials and raw products on the home industry. In particular, the plastics industry is vitally concerned about any likely increase in the imports of cellulose acetate, acrylic and polyvinyl resins, synthetic rubbers, etc., increasing quantities of which are now required for work ordered by the Ministry of Aircraft Production as well as other large Government and privately run armament concerns. It is realized that with the introduction of heavier bomber craft, such as the Stirling, Manchester and Halifax, as well as revised versions of

SINCE 1918

PLASTIC MOLDS

HAND
AUTOMATIC
SEMI-AUTOMATIC
and EXTRUSION to the LATEST METHODS

Designers and builders of all types of PLASTIC MOLDS.

Serving most of the leading molders in the country!

Our 1500-ton hydraulic Hobbing Press adds many advantages in obtaining lower mold costs.

Estimates on request.

EAGLE
TOOL & MACHINE CO.

37–39 Freeman St. Newark, N. J.
Phone: MARKET 3-1572
-1573

Brightonize for Progress!

MAKE BRIGHTON YOUR SOURCE FOR ALL VESSEL EQUIPMENT . . .

TANKS, Kettles, Coils, Condensers, Heat Exchangers, Varnish Kettle Trucks . . . practical working equipment of the best metals for each job!

WRITE for estimates on your special equipment needs.

BRIGHTON
COPPER WORKS
CINCINNATI, OHIO

MICHIGAN KNOWS THE PLASTIC BUSINESS LIKE ABC

B *is for* BALANCE

Customers recognize the vast experience of our organization and equally fine equipment . . . compression, injection and all mechanical requirements of a well-balanced plant.

"IT'S TIME TO CHANGE TO PLASTICS"

Compression, Injection and Extrusion Methods

CUSTOM M MOLDERS

MICHIGAN MOLDED PLASTICS, INC.
Porter, Michigan

Ameroid

CASEIN PLASTIC

- RODS
- DISCS
- SHEETS
- BLANKS
- PUNCHED FLAT SHAPES

Non-inflammable
•
Readily turned and machined
•
Wide color range

—for Fabricators

AMERICAN PLASTICS CORP.

225 West 34th St. New York City

Also manufacturers of
BUTTONS, BUCKLES, Game Parts, etc.

the Hampden, Wellington and Whitley, the proportion of molded components must necessarily be higher as experience of these in earlier aircraft has been so successful. There is definitely a very strong case for an increased quota of plastics materials from the States, especially the thermoplastics, as the home manufacturing industry cannot reasonably be expected to supply all the rapidly growing needs of the fighting services. Plastics are, in reality, just as much munitions of war as Tommy guns and hand grenades and no aircraft designer would ever seriously think of evolving a new type of craft which did not incorporate plastics in one form or another. Experience has shown that the wise use of plastic components means greater efficiency, lighter weight and an increased bomb load.

There is a heightened interest in Great Britain in scrap material. Whereas at one time it was exceedingly difficult to get rid of scrap cellulose acetate, firms are now clamoring for supplies. The acetate waste is reprocessed and heavily pigmented to form a black material which fulfills many important requirements in the aircraft industry. The reprocessed material is said to have a slightly higher impact strength than the normally manufactured black, but no figures are available to substantiate this. Manufacturers generally have a very high opinion of it. Apart from acetate, there is also a growing demand for recovered nitrate from old ciné film and photographic material generally. This refashioned celluloid finds important uses where an opaque and slightly more brittle nitrate can safely be employed. Waste phenolic and urea resins are closely ground and used for filling purposes where their addition is not likely to reduce the physical properties of the molding to any noticeable extent.

Experience is rapidly accumulating regarding the respective merits and demerits, particularly the latter, of anti-percussion materials and a number of these have had to be written off as definitely unreliable, if not completely useless. Textile netting and transparent acetate tapes are probably the best and so far these materials have saved many lives in serious air raids throughout the country. Some large firms are, however, not satisfied with mere window protection, but are taking out the glass and substituting other materials. These include clear acetate panels, wire reinforced acetate panels, or ordinary Nottingham lace with a $^{3}/_{16}$ in. mesh thoroughly impregnated with cellulose acetate. The latter material is cheap and can be made quite easily and with the minimum of plant and labor using scrap colorless acetate. Owing to the enormous demand for all types of glass it is proving exceptionally difficult to secure deliveries of window glass for *blitzed* areas or of any other substitutes, most of which are only available to the large industrial concerns and not to offices and private concerns, houses, etc. A boon from the States would be fairly regular consignments of plastic glass substitutes which could be used for the rapid and temporary repair of buildings the window spaces of which are now usually boarded up after the glass has been blown out. The timber cannot easily be spared for this work and besides its use is costly as regards men and time. Moreover, while timber keeps out the draft, it also keeps out light.

A Government measure of unusual popularity has been the appointment by the Ministry of Supply of L. P. B. Merriam of British Xylonite fame as Controller of Plastics. Maybe this appointment seems of only parochial interest to American readers, but it is a pretty weighty straw showing which way the Government controlled industrial wind is blowing. The Ministry of Supply is now happily cutting through a forest of red tape and appointing men in control of key industries who really do know their jobs. Moreover, they are being encouraged to keep an eye on possible post-war developments as the Government is anxious to avoid all chances of a heavy slump within the next five years. The British plastics industry needs a strong and experienced hand to guide it. Not only must immediate orders be executed with the least possible delay but research must at all times be fostered and plans for post-war prosperity laid. It will not be any easy matter to find new outlets for the vast quantities of plastic materials now being used to feed the vital armament industries, but such uses must be found and the sooner the better. (*Mailed. March 13, 1941*)

***The Magic of Modern Plastics*—Color movie on tour**

★MOVING FROM ONE STATE TO ANOTHER IN A never-ending tour of the country, *The Magic of Modern Plastics*, the 1941 sound and color film produced by MODERN PLASTICS Magazine, has had over 135 showings since it first began its travels last October. There have been many requests for the film which could not be filled because of so many previous schedules. The Film Booking Dept. reports that during the winter season, bookings have been made almost two months in advance.

Thus far the film has visited cities in the following states: Alabama, California, Connecticut, Delaware, Florida, Idaho, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Texas and Wisconsin.

Among the groups to which the film was shown are: advertising clubs, various chapters of the American Society of Tool Engineers, American Society of Mechanical Engineers, Societies of Automotive Engineers, American Chemical Societies, Kiwanis, Rotary and Foremen Club groups, universities and colleges and sales and business organization and meetings.

Some of the comments from groups that have seen the movies are interesting. For example, Pratt & Whitney Aircraft writes: "We projected your very excellent film 9 times to about 1,000 men. These groups were made up of apprentices and students, engineers and executives, foremen and machine operators. All were unanimous in agreeing that this film is outstanding in its coverage of the present-day plastics industry..."

The Boston Section of the American Society of Mechanical Engineers says: "We had 206 engineers, etc. to see the film. For your information we have learned that it is one of the most popular films of definite appeal to engineers and laymen alike that we have had the pleasure of viewing."

A member of the Index Machinery Corp. who saw the movies at a meeting of the Advertisers Club in Cincinnati writes:

"This is a most excellent film and I consider it one of the finest picturizations of the possibilities of plastics I have seen. Looking about during the meeting occasionally and overhearing the conversations of other guests, it was indeed pleasant and inspiring to see such interest. All were fascinated at what they saw and not at all hesitant to express themselves."

Extensive bookings for the month of May have been made. We are listing below the representatives who have reserved the film and anyone desiring to attend such showing can probably make arrangements directly with the individuals or groups listed. May 5, Lars Ekwurzel, Beaumont, Heller & Sperling, 121 N. 8th St., Reading, Pa., Advertising Club; May 6, E. W. Jamison, Warren Telechron Co., Ashland, Mass., The Turret Club; May 7, Stanley S. Johns, American Society of Tool Engineers, 806 Evesham Ave., Baltimore, Md.; May 8, Advertising Club, R. C. Brown, University of Dayton, Dayton, Ohio; May 9, Dr. Joseph P. Wondolowski, 27 Vernon Street, Worcester, Mass.; May 10, 13, Dr. E. Byron Kelly, Pittsfield Bldg., 55 E. Washington St., Chicago, Ill., Illinois State Dental Society, Peoria, Ill.; May 15, Purchasing Agents Association, P. T. Skove, Perfection Stove Co., 7609 Platt Ave., Cleveland, Ohio; May 16, New England Day, F. W. Bliss, General Electric Co., 140 Federal Street, Boston, Mass.; June 5, SAE Convention, C. B. Whittelsey, Jr. showing at Greenbrier Hotel, White Sulphur Springs, W. Va.; June 9, Chemical Salesmen's Assoc., Wilson & Geo. Meyer & Co., Federal Reserve Bank Bldg., San Francisco; June 13, Foremans Council, W. Patrick, Tool Supervisor Curtiss Aeroplane Div., Buffalo, N. Y.; June 19, Martinez Kiwanis Club, Wilson & Geo. Meyer & Co.; June 26, W. E. Drew, Nat'l Assoc. of Power Engineers, P. O. Box 3344, Jacksonville, Fla.; July 17, Prof. Arthur R. Young, Teachers College, Columbia University, N. Y. C.

However, there are additional bookings open for you and your organization. You can prepare a vital and timely discussion or lecture program built around this lively, entertaining film

Write now for open dates. Address Publicity Director, MODERN PLASTICS, 122 East 42nd Street, New York.

CATAVAR
Resins for
LAMINATING
IMPREGNATING
SURFACE FINISHING

CATABOND
Resins for
WOOD
CORK
ABRASIVES
BRAKE LININGS

CATALIN LIQUID RESINS are the culmination of years of collaboration on the part of our research staff with manufacturers in many fields. These versatile resins cover an infinite range of industrial and technical applications and have, through exhaustive field and laboratory tests, demonstrated outstanding merit.

We cordially invite your inquiry and the opportunity of offering you the services of our staff for experimentation or recommendation.

CATALIN CORPORATION · ONE PARK AVE., NEW YORK

Catalin, Catavar and Catabond are reg. trade marks

ADVERTISING PAGES REMOVED

CHARLES A BRESKIN, Publisher
WILLIAM T. CRUSE, Editor
DR. GORDON M. KLINE, Technical Editor
HARRIET B. JOSEPHS, Managing Editor
HELEN SHALET, Associate Editor
DONALD R. RUTHER, Art Director

modern plastics

JUNE 1941

VOLUME 18 NUMBER 10

NEXT MONTH

Two important objectives of the lumber industry have been the achievement of "stabilization" or control of warping, shrinking and swelling tendencies of wood; and the addition of mechanical properties such as greater compression and shear strength and improved specific gravity. The Lignum Process, a method of impregnating green logs with liquid phenol formaldehyde resin, makes a positive step in reaching that objective. Dr. Monte W. Wladaver describes this technique in our July issue.

Heading the July Technical section is a report by R. W. Wakeman on "Dimensional changes of plastics in boiling water," a significant long range investigation undertaken at the Mellon Institute of Industrial Research for the Pittsburgh Equitable Meter Company.

Increasing uses of Fiberglas in combination with various plastics materials have been developed recently particularly for thermal and sound insulation in refrigeration, air-conditioning and electrical fields, and for airplane fabrics. Tyler Stewart Rogers, technical director of Owens-Corning Fiberglas Corp., has prepared a comprehensive article on such applications.

GENERAL INTEREST

Evolution of safety glass 31
Quality rings up sales 39
Pan-handled broom 41
Cellulose acetate printing plates 42
Acrylics in aircraft 43
Fashion frontiers 46
A. R. P. apparel 52
SPI meets at Hot Springs 56
Molded plumbing hardware 57

TECHNICAL SECTION

Process anneals of mold steels 63
Speed nut assembly system 66
Phenolic with cottonseed hulls 68
Plastics digest 70
U. S. plastics patents 72

NEWS AND FEATURES

Product development 50
Plastics in review 54, 58
Stock molds 62
Publications 76
Machinery and equipment 78
In the limelight 80
London letter 102

Cover colors this month BLUE OCEAN and CARIB ROSE (Created by Textile Color Card Association)

BUSINESS STAFF: ALAN S. COLE, General Manager
E. R. GORDON, Production — P. H. BACKSTROM — J. M. CONNORS — L. B. CHAPPELL
R. G. GERMAISE, Circulation — M. A. OLSEN — R. L. DAVIDSON — W. S. ROSS, Promotion

Published the 5th of each month by Breskin Publishing Corporation. Publication office, Twentieth and Northampton Sts., Easton, Pa. Executive and Editorial Offices, 122 E. 42nd St. (Chanin Bldg.), New York, N. Y. Phone AShland 4-0655. Mid-Western office, 221 N. LaSalle St., Room 1338, Chicago, Ill. Phone Randolph 6336. Pacific Coast Office, 427 West 5th St., Los Angeles, Cal. Cleveland, Ohio, Office, 1010 Euclid Ave.; telephone Prospect 2020. Also Publishers of Modern Plastics Catalog, Modern Packaging, Packaging Catalog. Subscription price $5.00 per year, $8.00 for 2 years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year, $9.00 for 2 years, all other countries, $6.00 per year, $10.00 for 2 years, payable in American money or its equivalent. Price 50¢ per copy, except October issue, which is $2.00. Copyright 1941 by Breskin Publishing Corp. All rights reserved. Printed in U. S. A. Entered as second class matter May 28, 1940, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Back numbers (except October) 3 months or more preceding current issue, when available, $1.00 each. Modern Plastics is fully protected by copyright and nothing that appears in it may be reprinted, either wholly or in part, without special permission.

Member of Controlled CCA Circulation Audit